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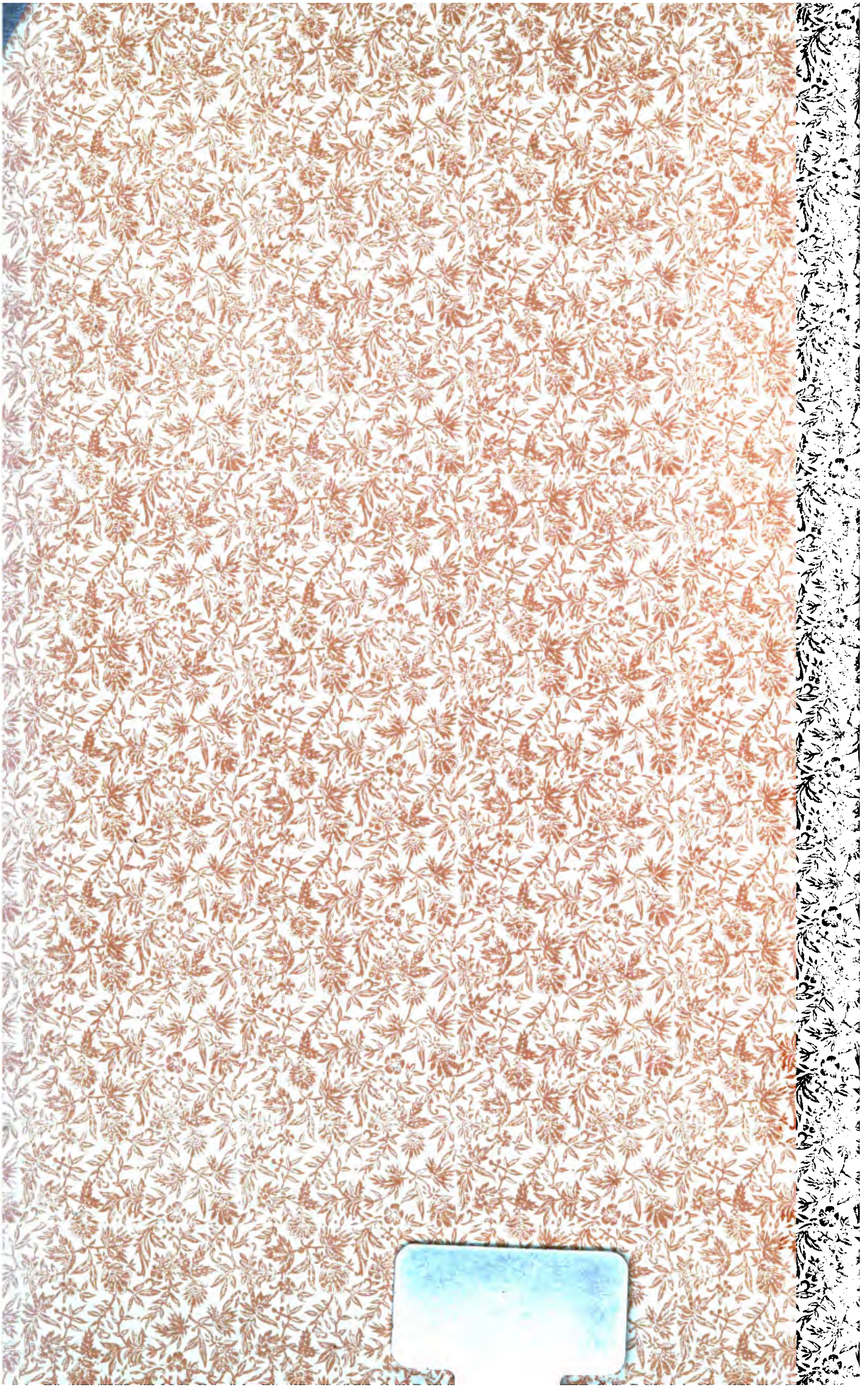

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FINAL REPORT

OF THE

Commissioners of Sewerage

OF

LOUISVILLE, Ky.
(Incorporated)

Work Done Upon the Comprehensive System of Sewers
From February 26, 1906, to March
31, 1913

LOUISVILLE, KENTUCKY
1913

Commissioners of Sewerage of Louisville

Louisville, Kentucky

MEMBERS OF COMMISSION

P. L. ATHERTON
(To January 1, 1912)
Chairman February 26, 1906 to February 1, 1909
Chairman November 1, 1909 to January 1, 1912
Resigned from Commission January 1, 1912

OSCAR FENLEY, Chairman
Vice Chairman February 1, 1909 to January 1, 1910
Chairman January 1, 1912 to Date.

W. C. NONES, Vice Chairman
Vice Chairman February 26, 1906 to February 1, 1909
Chairman February 1, 1909 to November 1, 1909
Vice Chairman January 1, 1912 to Date.

THEODORE AHRENS
Resigned August 5, 1908

ALFRED SELLIGMAN
Appointed August 6, 1908 to Date.

Mayors of Louisville and Ex-Officio Members of Commission

HON. PAUL C. BARTH
February 26, 1906 to June 30, 1907

HON. ROBERT W. BINGHAM
June 30, 1907 to November 12, 1907

HON. JAMES F. GRINSTEAD
November 12, 1907 to November 16, 1909

HON. W. O. HEAD
November 16, 1909 to Date.

J. B. F. BREED, Chief Engineer
HARRISON P. EDDY, Consulting Engineer

HON. CHAS. P. WEAVER
Secretary-Treasurer

TABLE OF CONTENTS

Page.

ORGANIZATION OF THE COMMISSIONERS OF SEWERAGE.. 3

REPORT OF THE COMMISSIONERS OF SEWERAGE.......... 9

Sewer System and Care It Should Receive.................. 10

Financial 12

Personnel of Commission.................................. 14

Eugineering Department.................................. 14

Administration 15

Legal Department... 16

Audits 16

Competition in Contract Work........................... 18

Improvement of Beargrass Creek........................ 20

Conclusion 20

REPORT OF THE CHIEF ENGINEER AND CONSULTING ENGINEER—

PART ONE.

Historical 23

Organization 24

Receipts and Expenditures................................ 25

Methods of Doing Work................................... 27

Work Done by Contract.................................... 27

Contracts Completed by Surety Companies 35

Work Done by Day-Labor.................................. 36

Current Prices... 42

Work Done.. 43

- Southern Outfall.. 45
- South Louisville Branch Sewer.......................... 47
- Brook St. Sewer... 48
- Beargrass Intercepter and Connections................ 48
- Northeastern Sanitary Sewer........................... 50
- Old Bed of Beargrass Creek............................ 50
- Middle Fork Sewer...................................... 50
- Northwestern Sewer.................................... 51
- Western Intercepter.................................... 51
- Thirty-fourth St. Sewer................................ 52
- Relief Sewers... 52
- Lateral Sewers.. 56
- Storm Water Inlets...................................... 58
- Beargrass Creek Improvement.......................... 58

Page.
Effect of the Work of the Commission........................ 61
    Sewerage of Unsewered Territory........................ 61
    Diversion of Sewage from Beargrass Creek................ 63
    Relief from Flooding................................... 63
    Effect of Sewerage upon Health......................... 64
    Improvement of Beargrass Creek Channel................. 68
Adequacy of Sewer System................................... 69
Recommendations for New Work............................... 70
    Sources of Funds for Future Construction............... 74
Disposal of Sewerage....................................... 75
Sewer System and Care It Should Receive.................... 76
Rights of Way.. 81
Testing Laboratory... 83
Bookkeeping 85
Precipitation 85
Record Drawings 86

PART TWO.

Construction 86
    Southern Outfall 86
    South Louisville Branch Sewer.......................... 87
    Brook St. Sewer.. 87
    Beargrass Intercepter.................................. 89
    Connections to Beargrass Intercepter................... 91
    Northeastern Sanitary Trunk Sewer...................... 97
    Northeastern Drain..................................... 98
    Middle Fork Sewer...................................... 99
    Northwestern Sewer.....................................104
    Western Intercepter....................................109
    Thirty-fourth St. Outlet...............................111
    Twelfth St. Sewer......................................112
    Oak St. Sewer..112
    Fifteenth and Twenty-third St. Sewers..................113
    Seventh and Hill St. Sewers............................114
    Twenty-first St. Sewer.................................115
    Dumesnil St. Sewer.....................................116
    Thirty-second and Dumesnil St. Sewers..................116
    Jefferson St. Sewer....................................117
    Twenty-eighth St. Sewer................................117
    Cedar St. Sewer..118
    Thirty-fourth St. Sewer................................119
    Third St. Sewer..119
    Fourth St. Sewer.......................................120
    Second St. Sewer.......................................121
    Central Ave. Sewer.....................................123

Page.
  Eighth and St. Catherine St. Sewer....124
  York St. Sewer....125
  Ewing Ave. Sewer....126
  Jane St. Sewer....126
  Frankfort Ave. Sewer....127
  Long Ave. Sewer....129
  Alta Ave. Sewer....129
  Barney Ave. Sewer....131
  Castlewood Sewer....132
  Improvement of Channel of Beargrass Creek....134
Acknowledgment....142
List of Employes in Engineering Department....143

APPENDICES.

(A) Summary of Bids....146
(B) Table 1. Contracts and Location of Sewers.
  Table 2. Quantity, Character and Prices of Excavation.
  Table 3. Quantities and Prices of Concrete and Steel Reinforcement.
  Table 4. Rates of Progress of Construction.
(C). Location and Description of Sewers....175
(D) Table of Rights of Way....196
(E) Table 1. Intensity of Precipitation....199
  Table 2. Monthly and Annual Precipitation, 1871-1912....200

TABLES.

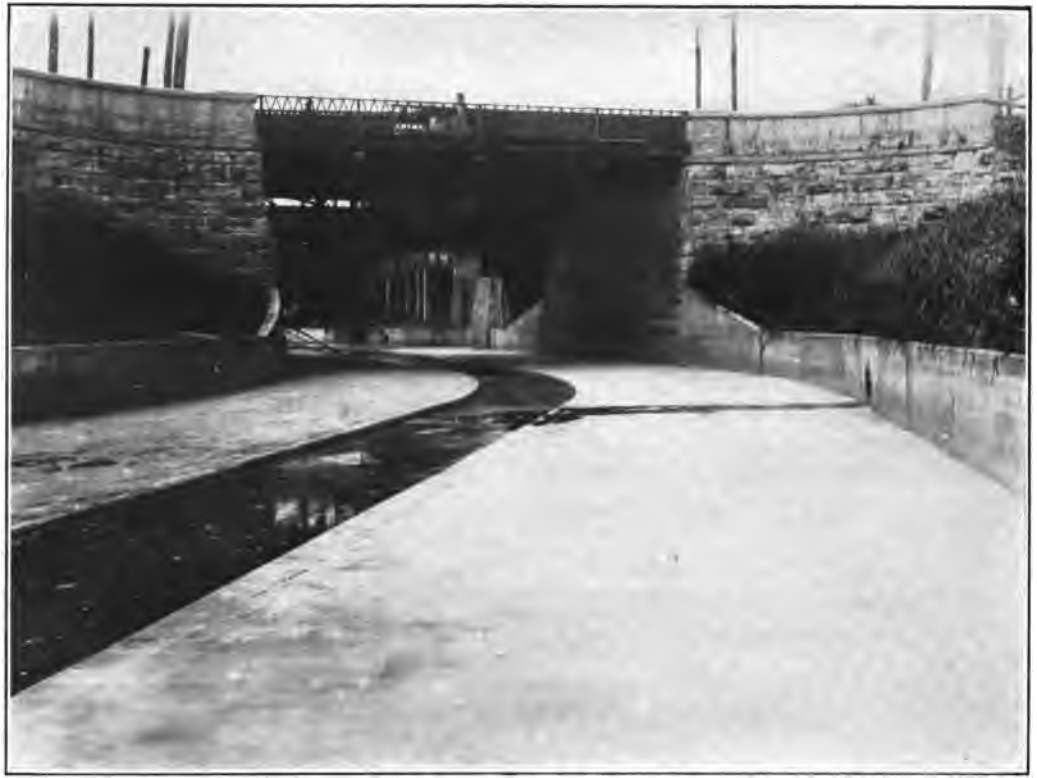
· Comparison of Lowest and Local Bids.... 19
1. Statements of Funds Received and Expended.... 25
2. Engineer's Estimates, Proposals and Cost of Completed Contracts.... 29
3. Analysis of Cost of Sewers Built by Contract.... 32
4. Engineer's Estimates, Proposals and Cost of Work Done by Day-Labor.... 40
5. Length of Sewers and Drains Constructed.... 44
6. Relief Sewers.... 54
7. Lateral Sewers.... 56
8. Population, Mileage of Sewers, House Connections and Typhoid Fever Rate.... 66
9. Inverted Siphons.... 78
10. Summary of Cement Tests.... 84

ILLUSTRATIONS.

Page.
Improved Channel of Beargrass Creek under Main St. Bridge...... 9
Improved Channel of Beargrass Creek under L. & N. R. R. Bridge.. 20
Diversion Chamber at Junction of Northwestern Sewer and Western Intercepter 51
Improved Channel of Beargrass Creek at Junction of South and Middle Forks 58
Improved Channel of Beargrass Creek Progressive Views of Work.. 60
Improved Channel of Beargrass Creek, Sections B and C.......... 68
Junction Chamber at Brook Street and Avery Avenue for Overflow Drain 88
Reduction Chamber, Northwestern Sewer..........................106
Wooden Form for Junction Chamber at Twenty-first St. and Bolling Avenue 115
Cross Section, Section B-1, Northwestern Sewer, 13 ft. 6 in. by 9 ft. 0 in. 118
Metal Forms, Section B-2, Northwestern Sewer...................122
Junction Chamber, Section B-2, Northwestern Sewer...............126
Improved Channel of Beargrass Creek, Twenty-four foot Wall below Baxter Avenue........139
Beargrass Creek below Baxter Avenue, before Improvement...... 140
Improved Channel of Beargrass Creek above Baxter Avenue.........142

PLATES.

Diagram A—Relation of Proposals to Estimates................. 42
Plate A—Typical Sewer Sections.............................. 46
Plate B—Green St. Sewer Connection.......................... 48
Diagram B—Relation of Typhoid Fever to Growth of Sewerage System 66
Plate C—Cooper St. Sewer Connection.......................... 92
Plate D—Northwestern Sewer Outlet...........................104
Plate E—Details of Northwestern Sewer Outlet..................108
Plate F—Plan of Improvement of Beargrass Creek................134
Plate G—Types of Walls, Beargrass Creek Improvement..........137



Improved Channel of Beargrass Creek. Looking South under Main Street Bridge.

Report of Commissioners of Sewerage.

LOUISVILLE, KY., March 31, 1913.

To Hon. W. O. Head, Mayor:

Herewith we transmit to you and through you to the General Council of the City of Louisville, the report of our Chief Engineer, Mr. J. B. F. Breed, and Consulting Engineer, Mr. Harrison P. Eddy, showing in detail the work done by the Commissioners of Sewerage, of Louisville, from January 1, 1910, to March 31, 1913.

On February 11, 1910, in like manner, we transmitted the report of the Commission's Engineers, detailing the work done from January 1, 1907, to January 1, 1910. Previous reports of the Commission are dated August 21, 1906, and October 8, 1906. In these several reports the comprehensive plan proposed for sewerage of the entire city, the authorization of the bond issue of $4,000,000, the general plan of organization, and the earlier progress of the work so fully were set out that further reference to them is unnecessary.

The present report of the Engineers embraces the work done from January 1, 1910, to March 31, 1913, when the Commission's work as outlined in 1906, in so far as funds permitted, practically was completed. The Engineers' report is adopted and made part hereof.

It was known from the beginning that the funds at the disposition of the Commission were inadequate to provide all of the trunk line, intercepting, relief and lateral sewers required to properly sewer all localities within the city. While there still remains quite a good deal of sewer construction to give all parts of the city adequate sewer facilities, we have endeavored to make the best possible use of the funds at our disposal and have used such funds in the main for the construction of large trunk sewers which presented difficult engineering problems and which could only be built when a considerable sum of money was available at one time.

The main arteries provided for, the Commission undertook, so far as its funds permitted, the construction of the laterals for which the need was most insistent; the relief of plague spots and points in the city subject to overflow, resulting in damage to private property, and consequent litigation against the City of Louisville; and the drainage of low places adjacent to residences and factories in all sections of the city.

The present urgent needs are for additional lateral sewers to obtain the full use of the trunk sewers constructed by this Commission, and the further improvement of the channel of Beargrass Creek. Much of this can and doubtless will be done by the city from the proceeds of sale of its shares of Louisville Gas Company stock recently effected.

Features of Present Sewer System and Care It Should Receive.

The sewerage system of the city having been extended and perfected as far as possible with the money at the disposal of the Commission, it is now of the highest importance that the sewers, regulators, siphons, catch-basins, etc., which have been built, should be maintained in such a way as to develop the highest efficiency and to remain in good condition for a long period of years. The combined sewers, with which most of the city west of Beargrass Creek is served, are comparatively simple to maintain. East of Beargrass Creek have been built some separate sewers, that is, one sewer to receive the actual sewage and a different one to receive storm water. If these sewers are to serve properly the purposes for which they were constructed, sewage connections must be carefully made with the sanitary sewer. We regard this matter of such important magnitude, that to emphasize it and to avoid it being overlooked, we quote in full, from the Engineers' Report, as follows:

"*Features of Present Sewer System and Care which it should receive.* By far the larger part of the city is provided with combined sewers which are to receive both sewage and storm water. The northeastern portion of the city is provided with separate sewers and storm drains. This method of sewerage requires the construction of two pipes in each street, one which should receive sewage only, the storm water being strictly excluded. The other should receive the storm water and sewage should be excluded. The success of the separate system depends upon the strict enforcement of the separation of storm water from sewage. There have been, since these sewers were built, a number of instances where house sewers were improperly connected with the storm drains and where pipes carrying storm water were improperly connected with the sewers. The sewers are not of sufficient size to carry any considerable amount of storm water and if storm water is discharged into them in material amounts, they will be surcharged in time of storm, and the combined sewage and storm water will be forced back into the houses and may overflow upon the surface of the streets. A relatively small number of such connections might render the separate system a source of much damage and every care should be taken to prevent such connections. The storm drains, while large enough to accommodate both storm water and sewage, discharge into streams which ought not to be defiled with sewage. Some of these drains discharge into the Middle Fork, within the limits of Cherokee Park, and others discharge into the Edwards' Pond Branch, a small stream flowing along Letterle Avenue. The discharge of sewage into such streams will result in highly offensive conditions and should be prevented by the exercise of care to prevent the improper connection of house pipes carrying sewage, with the storm water drains. The record drawings turned over to the city, clearly indicate the character of the sewers and drains so that the official issuing permits for connections with the sewers and drains, can readily ascertain and designate to the drain layer, the pipe with which the house sewers should be connected, and the pipe with which the storm drains should be connected. The character of the sewers built by the Commission is shown in Appendix C."

Having recently called the attention of the Board of Public Works to a misuse of one of the sanitary sewers, we do not think it necessary to go into details about it here.

Financial.

In November, 1906, a bond issue of $4,000,000 was authorized by popular vote, the proceeds of said issue to go into the hands of the Commissioners of Sewerage of Louisville, for the construction of a comprehensive system of sewerage. Practically this entire amount has been expended March 31, 1913, together with $49,565.12 received by the Commission as accrued interest on bonds before they were sold, $147,009.59 as interest paid by the different banks on monthly balances of the Commission, and $13,384.29 contributed by the city as part cost of Thirty-second and Dumesnil Street sewer. The total receipts of the Commission have thus been $4,209,959.00.

The total premiums realized from the sale of the bonds was $24,718.43, and this amount has been turned over by the Commission to the Sinking Fund as directed by the Legislative Act creating the Commission.

All coupons attached to the bonds that were past due at the dates of bond sales, were clipped and turned over to the Sinking Fund.

The amount of past due coupons so turned over is shown by the following letter:

November 15, 1910.

Mr. Charles P. Weaver, Sec'y. and Treas. of the Commissioners of
Sewerage, Louisville, Ky.

Dear Sir: The following is a recapitulation of the receipts sent you, on various dates, of sewer coupons cut from Sewer Bonds, and delivered to the Commissioners of the Sinking Fund by the Commissioners of Sewerage:

		Total
Nos. 449 to 800, both inclusive, Series No. 1	352 Coupons	352
Nos. 801 to 1500, both inclusive, Series Nos. 1 and 2	700 Coupons	1,400
Nos. 1501 to 2150, both inclusive, Series Nos. 1-2-3	650 Coupons	1,950
Nos. 2151 to 2650, both inclusive, Series Nos. 1-2-3-4	500 Coupons	2,000
Nos. 2651 to 3425, both inclusive, Series Nos. 1-2-3-4-5	775 Coupons	3,875
Nos. 3426 to 3500, both inclusive, Series Nos. 1-2-3-4-5-6	75 Coupons	450
Nos. 3501 to 4000, both inclusive, Series Nos. 1-2-3-4-5-6-7	500 Coupons	3,500
	3,552 Coupons	13,527

making a total of 13,527 Sewer Coupons, $20.00 each, amounting to $270,540.00.

Yours truly,
J. M. TERRY,
Treas. and Sec'y.

The saving to the Sinking Fund in not being required to pay the coupons turned over to it by the Commission, greatly exceeds the preliminary expenses and all overhead charges incurred by the Commission during the entire period of its existence.

The restriction, placed by law, upon the Commission, prohibited the sale of the bonds at less than par, and accrued interest.

The bonds could not be engraved, and made ready for sale until after the issue was authorized, by the requisite vote at the election in November, 1906.

The National Bank of Kentucky, throughout the life of the Commission, has acted as its financial agent in the matter of the sale of its bonds, without any charge whatsoever, and to the great advantage of this Commission. We feel that in a large measure, the success of the Commission in the advantageous sale and small outside expense incurred in disposing of the bonds, was due to the services of the National Bank of Kentucky:

Changes in the Personnel of the Commission.

Mr. Theodore Ahrens, appointed a member of the Commission, when the same was constituted, by reason of ill health, found he could not continue in the work, and resigned on the fifth day of August, 1908.

In the matters of the organization of the Commission, in the discussion and adoption of plans for the doing of its work, and the method of the management of the business of the Commission, the sound advice and acute business judgment of Mr. Ahrens was invaluable; the influence and benefit of it survived his official connection with this Commission, and has continued to this time.

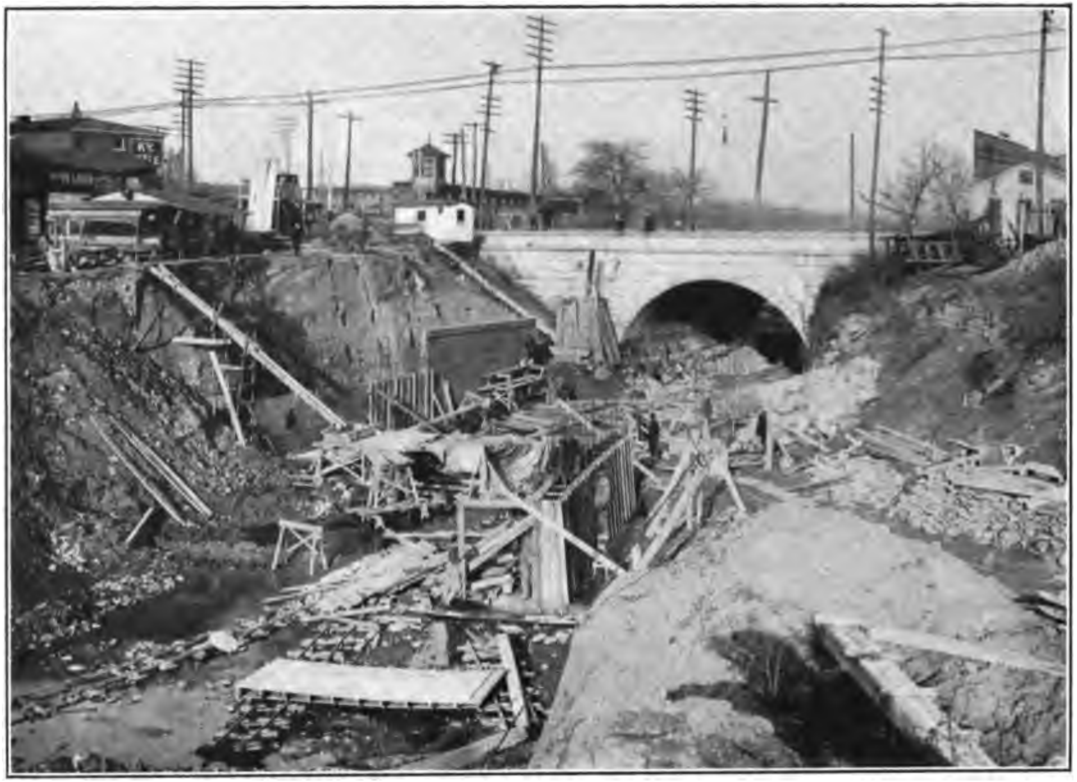
Mr. Peter Lee Atherton, was a member of the Commission from the date of its establishment, until the first of January, 1912, when he tendered his resignation, in order to accept the office of a member of the General Assembly of the Commonwealth of Kentucky. During this period, except for a few brief periods, he was its Chairman.

Since his withdrawal from the Commission, at the time above mentioned, he has continued to act with it in an advisory capacity, and undertaken the adjustment of many of the matters which arose during his chairmanship, and has given this Commission freely the benefit of his energy and grasp of its affairs.

Engineering Department.

The organization of this important department, was shown in detail in the report of February 11, 1910. The Chief Engineer of the Commission, Mr. J. B. F. Breed, has continued in office and has served in the same capacity throughout the life of the Commission. The services of the Consulting Engineer, Mr. Harrison P. Eddy, M. Am., Soc. C. E., of Boston, Mass., were not required after May 1, 1911, excepting for a few days in 1912.

The Commission considers that it is appropriate in this permanent form, to express its appreciation of the services rendered to this Commission and to the City of Louisville,



Improved Channel of Beargrass Creek. General view of construction upon Section "D" looking down stream toward Baxter Avenue Bridge.

by Mr. J. B. F. Breed, the Chief Engineer, and Mr. Harrison P. Eddy, the Consulting Engineer; by Mr. J. H. Kimball, M. Am. Soc. C. E., the Designing Engineer, and by Messrs. F. C. Williams, H. S. Morse, Assoc. M. Am. Soc. C. E. and H. P. Wires, Resident or Division Engineers.

Mr. Breed is a native of the City of Louisville; was its City Engineer for many years, and brought to the performance of his duties a thorough knowledge of local conditions, high practical and technical skill, and a thorough and high minded devotion to his duties. His services are a testimonial to his character and capacity.

Mr. Harrison P. Eddy, of the firm of Metcalf & Eddy, of Boston, Mass., as Consulting Engineer, rendered this Commission a service no less notable. In the work done in Louisville, Mr. Eddy has added to his already splendid reputation. To his knowledge of the ability and character of men in his profession throughout the country, is due the fact that this Commission was able to make an organization of high efficiency and exacting standards. The young men whom he assembled in this organization would be a credit to any profession, and under his guidance, and with the co-operation of Mr. Breed, have demonstrated that the doing of public work can be conducted with the highest efficiency, personal devotion and honesty.

Mr. J. H. Kimball, the Designing Engineer, is also entitled to the commendation and praise of this Commission for his attention and skill.

Messrs. Williams, Morse and Wires, alike deserve individual mention and approval.

The Commission would feel that it was delinquent in its duty to the public, and to these devoted men, if they failed to say this much on behalf of these faithful public servants.

The subsequent management of this department is shown in the Engineers' report, pp 23 to 144.

Administration.

Hon. Charles P. Weaver, from the beginning, has been Secretary and Treasurer of the Commission. He has been faithful, competent, laborious, and efficient in the performance of his important duties, which have been performed in a highly satisfactory manner.

Legal.

Hon. E. J. McDermott, assisted by Judge Alex. P. Humphrey, and Judge A. E. Richards, drew the enabling act passed by the Kentucky Legislature, and pursuant to which the Commission was created and the bonds authorized. This valuable service was rendered without any compensation.

Thereafter, Judge Alex. P. Humphrey by advice and service gratuitously rendered frequently has been of the greatest benefit and help to this Commission in the performance of its duties.

The onerous legal work of the Commission was successfully carried on by Mr. John Marshall, assisted by Mr. W. W. Crawford.

The labors of the Commission will be concluded without any known unsettled controversies, or law suits, to which desirable result, its attorneys and counsellors at law greatly contributed.

Audits.

On November 30, 1906, an examination of the books and accounts of the Commission was made by S. S. Eastwood, expert accountant, and on July 1, 1907, and January 1st and July 1st, of each year since 1907, similar examinations were made by A. R. Cooper, expert accountant. The final examination was made by James S. Escott, Public Accountant and Auditor, whose report in full is submitted herewith, and made part hereof.

The receipts and disbursements of the Commission as shown by his report, were as follows:

EXHIBIT NO. 1.

COMMISSIONERS OF SEWERAGE.

SUMMARY OF RECEIPTS AND DISBURSEMENTS.

March 30, 1906, to March 31, 1913.

Receipts.

Funds borrowed for preliminary expenses		$ 55,000 00
Sale of Bonds		4,000,000 00
Accrued Interest on same		49,565 12
Interest on Deposits		147,009 59
City of Louisville—part cost of 32nd St. and Dumesnil St. Sewer		13,384 29
Premium on Bonds sold	$25,045 00	
Less Express Charges	326 57	
		24,718 43
Total		$4,289,677 43

Disbursements.

Bills Payable	$ 55,000 00	
Preliminary Expenses	57,271 74	
Expenses preliminary studies—construction not attempted	5,572 03	
Contract work and additions thereto	3,740,869 69	
Day labor work under Commission	401,748 05	
Beargrass Intercepter—Maintenance	1,598 89	
Stock Account—Material	63 84	
Premiums on Bond Sales—Paid into Sinking Fund	24,718 43	
Total		$4,286,842 67
Balance Cash on hand April 1, 1913		$2,834 76

It will be seen from the above that $142,617.74 in *excess of the face value of the entire bond issue* has been expended in construction work, and in the engineering and overhead supervision directly chargeable to construction work.

Advantages of Broad Competition in the Contract Work.

The Commission aimed to give the City of Louisville the largest extent of well-constructed sewers that it was possible to obtain for the amount of the bond issue. To this end, advertisements for proposals for each letting were placed in several engineering and contracting journals, of wide circulation, as well as in the local newspapers. As a result of this method of advertising lettings, the Commission received on eighty-six contracts, 445 bids from 72 contractors (26 local and 46 from other places) coming from twelve States, thus giving the city the benefit of honest, keen and wide competition. On every contract, there were several bidders, and in every instance, the Commission awarded the contract to the lowest bidder, or, if the lowest bid was not satisfactory, undertook and completed the work by a day-labor force.

The following table shows the results of this plan:

TABLE SHOWING COMPARISON OF LOWEST AND LOCAL BIDS.

NAME	Lowest Bid	Lowest Local Bid	Difference
2 Southern Outfall, "B"	$296,524 13	$336,680 83	$40,156 70
4 Beargrass Intercepter, "A"	91,698 98	168,346 10	76,647 12
5 Southern Outfall, "C"	215,913 50	245,267 20	29,353 70
6 Southern Outfall, "A"	91,597 64	104,782 00	13,184 36
8 Twenty-fifth Street, "A"	30,035 54	37,236 69	7,201 15
11 Southern Outfall, "D"	185,470 38	206,121 90	20,651 52
14 Southern Outfall, "E"	106,471 52	111,892 08	5,420 56
16 Beargrass Intercepter, "D"	35,124 15	42,674 80	7,550 65
20 Southern Outfall, "F"	70,554 28	117,131 46	46,577 18
25 Twelfth Street	79,156 20	122,813 18	43,656 98
29 Southern Outfall, "G"	85,428 98	No local bidder	
31 Northeastern, "B"	12,658 43	No local bidder	
35 Beargrass Intercepter, "E"	30,670 30	No local bidder	
36 Northeastern, "A"	137,525 04	217,717 98	80,192 94
42 Northwestern, "A"	27,834 29	44,168 61	16,334 32
43 Beargrass Intercepter, "C. 3"	27,385 68	43,987 43	16,601 75
44 Thirty-fourth Street Outlet	47,744 22	No local bidder	
45 South Louisville Branch, "B"	78,011 00	94,996 20	16,985 20
46 Nineteenth Street	12,809 51	No local bidder	
49 Western Intercepter, "B"	43,965 45	No local bidder	
50 Ewing Avenue	20,071 88	28,191 80	8,119 92
51 South Louisville Branch, "C"	87,055 23	No local bidder	
53 Northwestern, "B. 1"	144,557 75	154,027 50	9,469 75
56 Southern Outfall, "D. 2"	44,062 61	84,744 15	40.681 54
58 Twenty-first Street	32,355 08	38,304 16	5,949 08
59 Jane Street	30,113 40	45,883 86	15,770 46
60 Beargrass Intercepter, "F"	34,226 22	45,337 60	11,111 38
62 Brook Street	102,643 37	158,159 78	55,516 41
64 Third Street	44,251 00	52,355 10	8,104 10
Total difference on 22 contracts	....	....	$575,236 77

Number of contracts on which there were no local bidders, 7.

NOTE—There were twenty-eight other contracts on which the lowest bidders were non-residents, but which are omitted from this list, as the difference between the bids was less than $5,000.00.

On a number of the larger contracts, however, local firms were the lowest bidders and the work was performed in a highly satisfactory manner.

Improvement of Beargrass Creek.

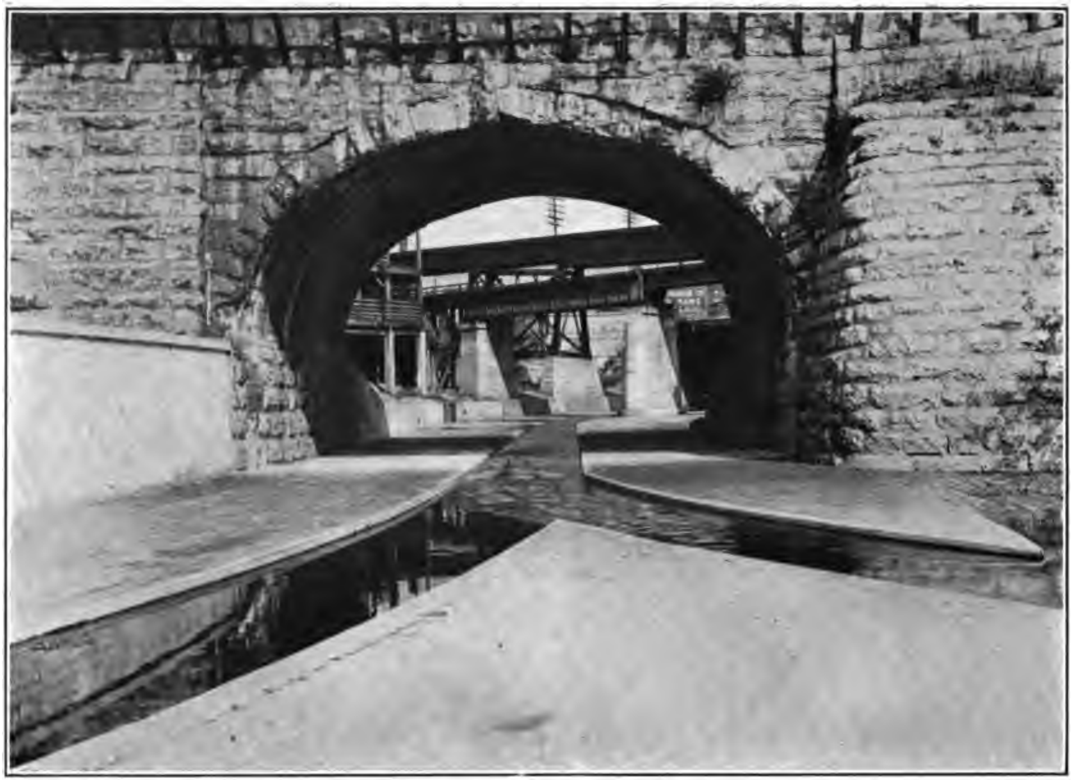
In the preliminary report of the Commission made as soon as the topographical map of the city was gotten out in October, 1906, some $35,000 was set aside to improve, by cleaning and filling up holes as far as possible, the channel of Beargrass Creek. After the engineering department had been organized and was in a position to make a careful study of such a complicated project as the improvement of the creek, the Commission requested the engineers to study the creek and report the result of their findings. A special report on Beargrass Creek was made to you by the Commission on February 11, 1910. For further explanation of that report and as to the work which has been actually done on Beargrass Creek, we refer to the present report of the engineers.

It will be seen, therefrom, that it is of the utmost importance to the city, both from a health standpoint and in order to reduce the amount of damage caused by freshets in Beargrass Creek, that the improvements so far as made, should be carried up the creek as rapidly as possible to the mouth of the Dry Run Sewer near Caldwell Street, the efficiency and capacity of which largely will be increased thereby.

Conclusion.

Since January 1, 1912, there have been only four members on the Commission, including the Mayor as a member ex-officio. Since July 1, 1912, there being practically no work under construction, excepting the improvement of Beargrass Creek, the Commissioners voluntarily have relinquished their salaries.

The Commission wishes to again express its appreciation of the efficiency and loyalty of the engineering and clerical force. As the work has drawn to a close, it has been, naturally, difficult to maintain a small and efficient force, but where it has been necessary to the success of the work that certain men remain to carry it out, they have declined offers of more permanent positions in order to see the work through.



Improved Channel of Beargrass Creek under L. & N. R. R. bridge. Looking North from junction of South and Middle Forks.

The Commission desires in the name of the city to thank the many public-spirited citizens who have given free rights of way for the construction of sewers through property owned by them, and for rights of way given along Beargrass Creek.

The donors of rights of way were as follows:

C. C. Mengel & Bro. Co.
American Tobacco Co.
S. P. Brown
Southern Railway Co.
C. V. Mehler
John H. and Jas. P. Whallen
Pius and Max Fischer
The American Oak & Leather Co.
W. L. Kennett
James S. Pirtle
Blanche T. Ballard
M. L. Leibert
Mary H. Keating
Joe Scheffer, Jr.
Mary Smith
P. Macauley Birckhead
Jacob Frank
Mary F. Howe
L. L. Anderson
Herman Blatz
M. H. Norton
Xavier Schuler
C. F. Vissman & Co.
Bourbon Stock Yards Co.
Alfred Struck Co.
John B. Castleman
J. P. and R. M. Gregory
Annie F. P. Bowles
Rowan Buchanan
Maud R. Starr
Mrs. E. L. Fitch
Standard Oil Co.
Louisville & Jeffersonville Bridge Co.
Sydney J. Blankenbaker
Carolina B. Miller
W. E. Koop
Katherine Fust
Elsie Trautwein
Lawrence Liebert
New Louisville Packing Co.
Louisville Tobacco Warehouse Co.
Henrietta T. Compton
Alice T. Drummond
Pius Metcalf
Frank Scheirich
W. W. Gregory
John F. Oertel Co.
Catherine Rehm
William Banks
Amelia Ritter
Sarah J. Pusey
Ben Fischer
Mary Frey
Mary Schoenbachler
Louisville Point Lumber Co.
E. A. King
W. B. and J. A. Pell
Louisville Property Co.
C. M. Phillips
Ben Hardin Rowan
C. J. Meddis
Caroline Brown
John Lewis, et al
Louisville & Nashville R. R. Co.
Kentucky Title Savings Bank and Trust Co.
W. P. Brown & Sons Lumber Co.
Kentucky Wagon Mfg. Co.
Kentucky State Board of Agriculture, Foresty & Immigration
Lorenz Pezold
James E. Bell
Antionette Grubitz
Isabella Lloyd
Jacob Doll
Katie Deming
Frank Miller
Catherine Bouchard
John Cudahy
Jos. and Wm. Spahn
Wm. Palmer
Christine Eisenmenger
R. E. L. Brear
Julia Sweeney
L. H. Lewis
H. H. Baumeister
Kentucky Distilleries & Warehouse Co.
Rev. Jas. P. Cronin, Admr.
Cave Hill Cemetery Co.
East End Improvement Co.
Emma Ruhl
Madge R. Frost
Ben F. Atchison Estate
Sarah A. McDonald, et al
Chess & Wymond Co.

There remain some matters necessary to be closed up before the Commission goes out of existence, that will be made the subject of a supplementary report to this one, but as they are of an unimportant character, the supplementary report will not be printed.

OSCAR FENLEY, *Chairman.*
W. C. NONES, *Vice Chairman.*
ALFRED SELLIGMAN.

[Seal]

Attest: CHAS. P. WEAVER, *Secretary.*
LOUISVILLE, KY., May 5, 1913.

Report of Chief Engineer and Consulting Engineer.

March 31, 1913.

Commissioners of Sewerage of Louisville:

GENTLEMEN—Pursuant to your request, we present the following joint report upon the work done by and under the supervision of the Engineering Department from the organization of the Commission to March 31, 1913.

In this report we have made an effort to place on record in permanent form the important matters relating to the work of this Department through the activities of the Commission, bearing in mind that the report of 1910 was quite complete and constitutes a record of the work done to that date and is available for reference.

This final report is divided into two parts, the first, dealing with the general features of the work done and recommendations made; second, being a detailed description of the sewers and other structures built between January 1, 1910, and March 31, 1913. Much of the data relating to the rights of way, contracts and precipitation records are compiled in five Appendices following the report proper.

PART ONE

Historical.

The citizens of Louisville have recognized for many years the inadequacy of the sewerage system and the importance of providing additional sewerage facilities. Several attempts were made prior to the appointment of the present Commission to secure popular approval of bond issues for sewer purposes but each met with failure. In 1906, legislative authority having been provided for the appointment of a Commission and the submission to popular vote of an ordinance providing for the issue of bonds for sewerage purposes, the Commission was organized and at once began activities by the appointment of the Chief Engineer under whose direction a topographic survey of the city and map were prepared, as fully set forth in the report of 1910. In the spring of 1906, a Board of Engineers, consisting of the Chief Engineer and two Consulting Engineers, Messrs. Saml. M. Gray, of Providence, R. I., and Harrison P. Eddy, of Worcester, Mass., were appointed in accordance with the provisions of the act, to prepare a report upon several systems of sewerage for the City of Louisville. After several visits to the city, during which the various conditions were carefully examined and a study of the problem, with the aid of the topographic map completed in the summer of 1906, the Board of Engineers reported to the Commissioners of Sewerage on September 29, 1906, suggesting three different systems of sewerage and recommending one system as the best adapted to the existing conditions. This recommendation was acted upon favorably by the Commissioners of Sewerage who reported to the Mayor in the following October. This recommendation was transmitted to the General Council and the plan recommended by the Commission was adopted. An ordinance was also passed by the General Council submitting to the people the question of whether the bonds for the amount of $4,000,000 should be issued for the purpose of constructing the system thus adopted. At the election in the following November, the necessary two-thirds vote was registered, authorizing the issue of bonds.

Organization.

After the issue of bonds was authorized, the engineering organization was developed from time to time as found necessary. The general scheme of organization of the engineering force, described in detail in the report for 1910, has been continued to date although, during the last two and one-half years, there has been as rapid a reduction as possible in the employes of this department as the number of contracts in force has been reduced and the several projects completed.

The engineers in charge of the several divisions continued to serve in their several capacities until the work of the divisions was materially reduced in amount, after which time, about February, 1912, the contract work was placed in charge of Mr. J. H. Kimball, who has remained in charge of the Headquarters Department, the "day-labor" forces being put under the direction of Mr. F. C. Williams, formerly in charge of the Southern Division. Messrs. H. S. Morse and Harrison P. Wires, in charge respectively of the Eastern and Northwestern Divisions, resigned February 29, 1912, and January 31, 1911, respectively.

Receipts and Expenditures.

A general statement of the receipts and expenditures is given in Table 1. It will be noted that the total receipts have amounted to $4,209,959.00, the amount in excess of $4,000,000 coming from the interest on bank balances and other sources.

TABLE NO. 1.

STATEMENT OF FUNDS RECEIVED AND EXPENDED AND BALANCE ON HAND MARCH 31, 1913.

			Per cent. of Total
Total Receipts		$4,209,959 00	
Preliminary Expenses	$ 57,271 74		1.36
Expended upon Sewers built by contract	3,740,869 69		88.92
Expended upon Sewers built by day-labor	252,960 21		6.01
Expended upon Improvement of Beargrass Creek	148,787 84		3.54
Expended upon Investigation and Report upon Improvement of Beargrass Creek	5,213 26		.12
Expended upon Miscellaneous Preliminary Surveys	358 77		.009
Expended upon Maintenance of Beargrass Intercepter	1,598 89		.04
Stock Account	63 84		.001
Total Expenditures		4,207,124 24	100.000
Balance		$2,834 76	

NOTE:—Estimated value of instruments, fixtures, automobile, topographic map, etc., turned over to city, $11,456.65.

The item amounting to $57,271.74 for preliminary expenses covered the cost of work done by the Commission prior to the commencement of actual construction and included the topographic survey and map of the city, the preliminary investigations and report of the Board of Engineers, and the expenses of administration. This account was closed July 10, 1907, when the first bonds were sold and all expenditures for administration and engineering since that date, with the exception of the amount expended upon the preliminary studies and report upon the improvement of Beargrass Creek, have been apportioned to the various contracts and projects built by day-labor.

The amounts given in Table 1 as having been expended on sewers built by contract, by day-labor, and upon the improvement of Beargrass Creek include not only the actual amounts expended upon construction but also the amounts expended for administration, engineering, the securing of rights of way and other incidental expenses.

The Beargrass Intercepter and connections require frequent inspection and the adjustment and cleaning of regulators, as hereinafter described in detail. As this is a new feature of the sewer system, the Commission felt that this work should be done by its employes for a time sufficiently long to demonstrate that the structures and apparatus give satisfactory results and, therefore, undertook the maintenance of this part of the sewer system for which the sum of $1,598.89 has been expended.

The Commission now has on hand a cash balance of $2,834.76 which will be used to meet remaining expenses and the balance will be paid into the hands of the Commissioners of the Sinking Fund, as provided in the Act authorizing the Commission. So far as is known no unsatisfied liabilities have been incurred by the Commission.

The Act under which the work of the Commission has been done stipulates that upon its dissolution all real estate and personal property, maps, plans, etc., in its possession shall become the property of the city. The estimated value of the property already turned over is $11,456.65.

Of the total receipts the sum of $13,384.29 was placed at the disposal of the Commission by the city for the purpose of assisting in the construction of the sewer in Thirty-second Street, this construction being done at the request of the Board of Public Works.

Methods of Doing Work.

At the outset the Commission adopted the general policy of doing all construction work by contract. This policy has been adhered to throughout although it has been deemed wise in some cases, and particularly upon the improvement of Beargrass Creek, to do some work by day-labor. A small day-labor force had been maintained almost continuously for the purpose of making borings and other work in connection with the engineering investigations. This force was gradually increased for the construction of a few sewers, regulators, catch-basins and the improvement of Beargrass Creek.

Work Done by Contract.

As already stated, it has been the policy of the Commission to do as much as practicable of its work by contract. From Table 1 it will be seen that the total expenditures upon contract work have amounted to 88.9 per cent. of the total expenditures of the Commission.

A total of eighty-three contracts have been awarded, each to the lowest bidder.

Contract No. 48 for the construction of Section D, Northwestern Sewer in Cedar Street, was awarded to the lowest bidder who declined to sign the contract, which was then re-advertised and awarded to the lowest bidder at the second letting. Three other contracts were advertised and bids received but the lowest bid on each of these being unsatisfactory, all bids were rejected and the work subsequently carried out by day-labor as will be hereinafter described.

Contract No. 42 for the construction of Section A, Northwestern Sewer awarded to the Ferro Concrete Construction Co., was subsequently taken over by the Commission, as described later, and completed by day-labor.

A portion of the work covered by Contract No. 11 for the construction of Section D, Southern Outfall, was taken away from the contractor because of lack of satisfactory progress and awarded, after advertisement, to the lowest bidder as Contract No. 56.

Contract No. 60 for the construction of Section F, Beargrass Intercepter, was abandoned by the contractor after a small portion of the work had been completed. A new contract No. 73 was drawn to cover the remainder of the work which was awarded to the lowest bidder after advertisement.

TABLE NO. 2.

ENGINEER'S ESTIMATES, PROPOSALS AND COST OF COMPLETED CONTRACTS.

Contract Number	Amount of Lowest Proposal	Engineer's Preliminary Estimate of Cost of Work Included in Proposal	Amount Paid Contractor	Engineer's Preliminary Estimate of Total Cost	Total Cost of Completed Sewer
1	$ 25,641 02	$ 27,650 00	$ 28,882 60	$ 30,279 89	$ 31,035 09
2	296,524 13	353,145 00	296,296 52	351,261 61	330,167 78
3	3,974 50	4,138 72	4,068 52	4,654 89	4,366 01
4	91,698 98	121,529 00	97,731 12	110,535 97	109,650 47
5	215,913 50	280,074 00	219,087 50	257,309 97	250,438 12
6	91,597 64	134,782 90	101,543 17	112,489 01	118,949 34
7	16,443 26	21,773 20	17,615 56	19,818 11	22,995 01
8	30,035 54	36,299 60	28,315 20	35,661 98	34,331 12
9	25,275 82	31,032 59	24,446 80	30,085 87	30,408 97
10	6,956 05	6,873 68	8,120 93	8,021 47	9,692 37
11	185,470 38	245,491 95	139,227 68	223,382 13	165,133 43
12	7,058 86	7,813 57	7,688 85	8,269 97	9,372 39
13	12,009 71	15,292 81	13,133 22	14,380 09	15,604 08
14	106,471 52	122,949 53	107,742 81	125,528 69	127,269 43
15	8,984 89	11,299 79	9,520 10	10,736 36	10,794 16
16	35,124 15	38,355 80	32,656 68	41,069 30	36,383 29
17	18,352 46	18,540 28	20,078 82	22,438 50	22,185 39
18	27,251 76	30,179 34	27,083 24	31,928 56	29,310 93
19	12,246 34	11,860 34	15,525 64	14,084 69	17,686 35
20	70,554 28	92,511 96	71,865 61	84,893 64	80,168 05
21	1,746 83	2,731 24	2,804 89	2,170 17	3,278 00
22	6,350 94	10,895 68	7,474 24	8,039 77	8,671 52
23	2,347 66	2,752 14	4,130 96	2,774 23	4,510 66
24	2,781 90	4,183 70	4,490 27	3,430 37	5,744 33
25	79,156 20	117,879 26	81,121 93	97,427 49	95,647 82
26	16,035 76	17,922 07	13,544 37	18,813 68	15,846 77
27	12,148 55	14,672 54	15,567 61	15,439 18	17,902 05
28	37,784 10	40,746 60	46,851 54	44,099 82	53,515 10
29	85,428 98	106,771 93	85,032 20	101,978 63	96,760 33
30	19,133 01	21,421 53	21,303 48	22,453 35	24,224 91
31	12,658 43	11,511 92	11,511 40	14,442 72	14,162 67
32	10,086 63	10,549 59	9,265 16	11,721 82	10,959 40
33	8,136 70	8,898 70	8,641 63	9,515 99	9,906 86
34	2,674 47	3,316 68	3,688 64	3,188 55	4,014 08
35	30,670 30	38,925 93	32,601 16	36,703 82	39,953 34
36	137,525 04	156,538 47	137,984 23	161,787 26	162,845 43
37	4,828 34	6,150 82	6,401 77	5,781 72	7,136 79
38	1,992 18	2,660 91	2,531 82	2,404 62	2,758 89
39	2,176 37	3,322 02	2,655 83	2,691 28	2,897 46
40	5,967 66	6,616 60	5,765 71	6,376 48	6,523 08
41	69,575 88	64,638 00	80,210 82	79,594 77	85,025 13
43	27,385 68	25,860 86	26,996 03	31,394 12	30,991 92
44	47,744 22	50,545 79	36,372 60	55,578 82	43,531 45

TABLE NO. 2—Continued.

ENGINEER'S ESTIMATES, PROPOSALS AND COST OF COMPLETED CONTRACTS.

Contract Number	Amount of Lowest Proposal	Engineer's Preliminary Estimate of Cost of Work Included in Proposal	Amount Paid Contractor	Engineer's Preliminary Estimate of Total Cost	Total Cost of Completed Sewer
45	78,011 00	96,841 20	94,027 16	93,021 39	101,682 01
46	12,809 51	11,217 21	15,502 22	14,548 18	16,831 77
47	4,588 69	7,690 99	5,104 40	5,780 79	5,619 77
48	51,484 65	47,016 70	51,298 78	58,772 23	57,940 96
49	43,965 45	37,711 00	43,525 36	49,810 66	52,698 59
50	20,071 88	22,189 29	17,669 03	23,511 23	20,859 24
51	87,055 23	94,682 36	90,066 93	101,731 00	99,082 19
52	11,984 51	11,221 19	10,538 16	13,723 80	12,094 94
53	144,557 75	151,369 98	135,059 87	168,020 10	149,096 15
54	80,064 72	80,980 68	79,622 38	92,616 72	84,565 04
55	79,504 80	76,695 36	75,008 33	91,392 59	85,434 31
56	(44,062 61)	56,259 94	41,204 29	(50,251 20)	43,974 22
57	5,095 10	5,850 40	5,608 06	6,001 91	6,626 74
58	32,355 08	28,268 58	32,280 86	36,736 71	35,850 56
59	30,113 40	28,227 67	32,146 57	34,488 63	35,955 76
60	34,226 22	30,203 38	—*4,568 73	(38,907 74)	—1,347 69
61	54,040 39	40,719 63	56,076 66	60,351 93	61,763 05
62	102,643 37	143,922 18	118,868 79	124,951 31	129,776 04
63	23,432 52	21,029 20	24,213 94	26,692 05	26,613 58
64	44,251 00	36,101 29	48,736 06	49,846 71	52,217 39
65	15,998 45	14,693 25	15,978 06	18,275 90	18,533 75
66	25,559 83	18,438 66	27,633 17	28,417 82	30,170 46
67	29,259 80	23,087 40	30,440 74	32,838 35	34,561 36
68	4,284 30	4,886 56	4,517 44	5,041 72	4,879 32
69	19,572 48	15,073 16	22,788 53	21,908 82	27,328 02
70	9,865 79	12,078 10	11,116 78	11,737 89	13,027 02
72	45,225 56	40,807 15	44,374 48	51,550 67	50,919 18
73	51,413 30	....	57,299 99	56,094 82	59,508 57
74	18,787 70	15,183 15	20,389 23	21,141 09	22,069 02
76	21,337 00	19,189 15	20,236 32	24,311 32	23,867 61
77	31,161 30	31,048 14	34,174 06	35,973 76	39,203 74
78	2,307 60	3,779 70	2,779 30	2,893 45	3,212 90
79	3,510 43	5,765 86	4,192 88	4,404 15	4,840 90
80	10,559 20	10,836 95	10,793 94	12,238 92	14,153 40
81	18,892 57	16,986 94	19,263 38	21,525 54	26,948 37
83	7,479 89	6,763 48	8,055 62	8,528 23	9,111 29
84	29,340 03	27,243 00	28,191 79	33,562 69	33,747 00
85	23,126 31	23,498 52	22,684 30	26,768 58	27,001 32
86	13,580 17	16,716 77	14,852 90	16,171 27	17,642 07
Total	$3,233,437 60	....	$3,289,330 89	$3,767,104 60	$3,740,869 69

*$8,480.00 recovered from contractor for failure to complete work.
Figures in parenthesis not included in total.

A statement of the Engineer's estimates, the amounts of the lowest bids and the cost of completed contracts is given in Table 2. The Engineer's preliminary estimates of the cost of work included in the proposals are strictly comparable to the amounts given in the second column, which are the amounts of the tenders of the lowest bidders to whom the contracts were awarded in all cases. In column 4 are given the total amounts actually paid the contractors which differed from the amounts bid on account of increase or decrease of the quantity of work actually done under the several items of the contract over or below the quantities included in the original proposals, and on account of amounts paid as premium or deducted from payments otherwise due as liquidated damages on account of delay.

At the time the Engineer's preliminary estimates of the cost of work included in the proposals were prepared, similar estimates of the total cost of the work were also made. These estimates are given in column 5 and are directly comparable to the figures given in column 6, which, in each case, is the total cost of the completed sewer. The total cost of the completed sewer includes, in addition to the amount paid the contractor, the cost of administration, engineering, rights of way, damages and relatively small amounts for supplies, such as castings and other metal work furnished by the Commission. Such materials, which were used in small amounts upon all of the sewers built were purchased by the Commission under separate contracts with manufacturers of or dealers in such supplies.

The form of contract adopted by the Commission is that known as the unit price contract under which practically all of the work is itemized in units, such as earth excavation per lineal foot, rock excavation per cubic yard, concrete masonry per cubic yard, etc.

Table 3 is an analysis of the cost of the sewers built by contract. The total amounts of the payments at contract unit prices are given in column 2. Under this form of contract prices are received for all of the items which it is possible to specify or anticipate in advance. As unforeseen difficulties are likely to arise, however, an item in the contract provided for the doing of such unexpected work under an item designated "extra work" which, in all cases, was specified at cost plus 15 per cent. The amounts paid for such extra work are given in column 4 of Table 3.

With the exception of five of the 83 contracts, both the premium and liquidated damage clauses have been included in all contracts awarded; under the former the sum of Twenty-five ($25.00) dollars per day was paid to the contractor for each and every day between the time of completion of the work and the time specified in the contract for such completion. Under the latter the sum of twenty-five ($25.00) dollars a day was deducted from other payments due the contractor for each and every day of delay in completing the contract after the expiration of the time stipulated for its completion. Contracts numbered 1, 2 and 4 included the liquidated damage clause but not the premium clause. Both clauses were omitted in contracts 76 and 81.

On several occasions contractors filed claims with the Commission for damages for which they maintained the Commission should make payments in addition to those stipulated under the regular items of the contract. The payments made on account of such damages are given in column 10. Although suits for some of these claims were filed in court none reached actual trial.

No suit brought against the Commission resulted in a judgment establishing a different construction of the contract other than that placed upon it by the engineer, although work was done under eighty-three contracts.

This was due in part to the carefulness with which the contract was drawn from both a legal and an engineering standpoint and also to the fact that extremely accurate contemporaneous data were at all times kept by the field force

		93 77						3 91				87 80		12.20		100.00
58	44,604.29	100.25 101.41					3,400.00	8.25 7.62			41.204.29	100.00 93.79	2,769.93	6.21	43,974.22	100.00
57	5,108.06	91.09 77.08			500.00	8.91 7.55					5,608.06	100.00 84.63	1,018.68	15.37	6,626.74	100.00
58	32,864.85	101.81 91.66	91.01	0.28 0.25			675.00	2.09 1.88			32,280.86	100.00 90.04	3,569.70	9.96	35,850.56	100.00
59	31,833.07	99.02 88.54	313.50	0.98 0.87							32,146.57	100.00 89.41	3,809.19	10.59	35,955.76	100.00
60	3,911.27								-8480.00	—	-4,568.73	100.00	3,221.04		1,347.69	100.00
61	54,761.53	97.65 88.59	229.13	0.41 0.37	1,100.00	1.96 1.79	14.00	0.02 0.02			56,076.66	100.00 90.73	5,686.39	9.27	61,763.05	100.00
62	116,905.85	98.34 90.08	462.94	0.39 0.36	1,500.00	1.27 1.15					118,868.79	100.00 91.59	10,907.25	8.41	129,776.04	100.00
63	24,315.93	100.42 91.37	48.01	0.20 0.18			150.00	0.62 0.56			24,213.94	100.00 90.99	2,399.64	9.01	26,613 58	100.00
64	47,741.18	97.97 91.43	169.88	0.34 0.33	825.00	1.69 1.57					48,736.06	100.00 93.33	3,481.33	6.67	52,217.39	100.00
65	16,529.49	103.45 89.19	48.57	0.30 0.26			600.00	3.75 3.24			15,978.06	100.00 86.21	2,555.69	13.79	18,533.75	100.00
66	27,383.17	99.10 90.75			250.00	0.90 0.83					27,633.17	100.00 91.58	2,537.29	8.42	30,170.46	100.00
67	29,891.14	98.20 86.47	174.60	0.57 0.51	375.00	1.23 1.09					30,440.74	100.00 88.07	4,120.62	11.93	34,561.36	100.00
68	3,892.44	86.17 79.77			625.00	13.83 12.81					4,517.44	100.00 92.58	361.88	7.42	4,879.32	100.00
69	21,735.47	95.38 79.53	228.06	1.00 0.84	825.00	3.62 3.02					22,788.53	100.00 83.39	4,539.49	16.61	27,328.02	100.00
70	11,049.38	99.40 84.82	67.40	0.60 0.52							11,116.78	100.00 85.34	1,910.24	14.66	13,027.02	100.00
72	44,234.97	99.69 86.87	14.51	0.03 0.02	125.00	0.28 0.24					44.374.48	100.00 87.13	6,544.70	12.87	50,919.18	100.00
73	53,847.01	93.97 90.40	377.98	0.66 0.63	3,075.00	5.36 5.16					57,299.99	100.00 96.19	2,268.58	3.81	59,568.57	100.00
74	19,139.23	93.87 86.71			1,250.00	6.13 5.66					20,389.23	100.00 92.37	1,679.79	7.63	22,069.02	100.00
76	20,236.32	100.00 84.79									20,236.32	100.00 84.79	3,631.29	15.21	23,867.61	100.00
77	32,417.62	94.86 82.69	181.44	0.53 0.46	1,575.00	4.61 4.02					34,174.06	100.00 87.17	5,029.68	12.83	39,203.74	100.00
78	2,039.98	73.40 63.49	39.32	1.41 1.22	700.00	25.19 21.79					2,779.30	100.00 86.50	433.60	13.50	3,212.90	100.00
79	3,307.07	78.87 68.32	10.81	0.26 0.22	875.00	20.87 18.08					4,192.88	100.00 86.62	648.02	13.38	4,840.90	100.00
80	10,825.11	98.43 75.07	93.83	0.87 0.66	75.00	0.70 0.53					10,793.94	100.00 76.26	3,359.46	23.74	14,153.40	100.00
81	19,263.38	100.00 71.48									19,263.38	100.00 71.48	7,684.99	28.52	26,948:37	100.00
83	7,330.62	91.00 80.46			725.00	9.00 7.96					8,055.62	100.00 88.42	1,055.67	11.58	9,111.29	100.00
84	27,577.01	97.82 81.72	14.78	0.05 0.04	600.00	2.13 1.78					28,191.79	100.00 83.54	5,555.21	16.46	33,747.00	100.00
85	22,432.61	98.89 83.08	76.69	0.34 0.28	175.00	0.77 0.65					22,684.30	100.00 84.01	4,317.02	15.99	27,001.32	100.00
86	15,352.90	103.36 87.03					500.00	3.36 2.84			14,852.90	100.00 84.19	2,789.17	15.81	17,642.07	100.00
Total	3,290,643.69	100.04 87.96	32,431.20	0.98 0.87	26,900.00	0.82 0.72	66,614.00	2.02 1.78	5,970.00	0.18 0.16	3,289,330.89	100.00 87.93	451,538.80	12.07	3,740,869.69	100.00

resulting in few real disputes between the contractors and the engineer as to facts concerning the work.

The total amounts paid the contractors under the regular items of the contract and including premiums, liquidated damages and amounts paid on claims are given in column 12.

As has already been stated, the cost of administration and engineering from July 10, 1907, to the completion of the work has been distributed among the various projects undertaken. The amount of such charges and of small incidental items not included in the contracts is given in column 14 of Table 3. The total cost of each contract is given in column 16.

The relation of the several items of payment given in Table 3 to the total amounts paid the contractor and the total cost of the work are given in terms of percentage in the heavy and light-faced figures.

In Appendix A are given the summaries of the bids upon each of the contracts not included in the report of 1910. Each summary gives all of the items of the contract upon which prices were taken, the quantities upon which the several bids were compared, the unit prices tendered, and the amounts under the several items, and the total amounts of each bid. The contract was awarded in each case to the lowest bidder as indicated by the totals of the several bids.

The contracts have been advertised in one engineering journal in Chicago and two similar journals in New York and a trade journal published in Baltimore. The total number of bids received at all lettings was 445, the minimum number upon any contract being 2, the maximum number being 11, and the average number of bids per letting, 5.2.

In Appendix B are given various data relating largely to the sewers built by contract.

The names by which the various sewer contracts were designated, the approximate location of the work, the name of the contractor, the date of the contract and the date of completion are given in Table 1. In Table 2 of this Appendix are given various data relating to the quantity and character of excavation and the prices paid for the same. As the same data relating to the first sixty contracts were tabulated in a similar manner in the report of 1910, this table pertains only to the succeeding contracts between numbers 61 and 86, both inclusive. The unit quantities and prices of concrete and steel reinforcement are given in Table 3 of Appendix B. As the data given in a similar table in the report of 1910 were complete for the first sixty contracts, this table relates only to contracts between numbers 61 and 86, both inclusive.

An attempt has been made to give data in Table 4 of Appendix B, from which an intelligent conception of the rate of progress upon the several contracts can be obtained. This table includes, among other data, the quantity of excavation, concrete and steel per lineal foot of sewer; also the number of cubic yards of excavation per day, the average number of cubic yards of concrete placed per day, the average lineal feet of sewer built per day, and the maximum and minimum rates of progress for one month in lineal feet of sewer constructed. The data given in a similar table in the report of 1910 was not complete as many of the contracts included had not been finished, consequently this table includes all of the contracts awarded by the Commission.

The total amount expended upon contract work, including all charges, whether for overhead expenses or on account of contracts, was $3,740,869.69. The total amount of money expended other than payments to contractor was $451,538.80 or 12.07 per cent. of the total cost of this work. In the following table are given the several general items of such expenses and the per cent. which each was of the total expenditures on account of contract work on January 31, 1913.

DISTRIBUTION OF EXPENSE OTHER THAN PAYMENTS TO CONTRACTOR, ON CONTRACT WORK, TO JANUARY 31, 1913.

Item	Total Cost	Per Cent. of Total Expenditures
Administration	$ 78,025 03	2.09
Engineering	336,544 87	9.00
Rights of Way	12,319 36	0.33
Castings and other metal work supplies	15,461 29	0.41
Damage Suits (exclusive of Rights of Way)	8,307 52	0.22
Amount of Payments to Contractors	3,289,330 89	87.95
	$3,739,988 96	100.00

CONTRACTS COMPLETED BY SURETY COMPANIES.—The total number of contracts completed under the original agreements made by the Commission was eighty-three. Of this number ten, involving but six contractors, were completed by or at the expense of the sureties on the several contracts.

The reasons for the failure of these contractors to complete their work appeared to be lack of previous experience in this class of work, insufficient capital, inefficient business management, liabilities arising from construction work undertaken elsewhere and low prices bid for the work undertaken.

It should be stated to the credit of the surety companies that almost without exception they carried the work to completion in a satisfactory manner and with reasonable promptness, although suffering substantial losses in several instances.

In addition to the ten instances mentioned above, the lowest bidders upon the Green Street Sewer in October, 1908, refused or failed to sign the contract which had been awarded to them. The surety upon the proposal bond, the United Surety Co., of Baltimore, recognizing its obligation offered to have a local firm execute a contract for the work at the prices named in the original proposal and to join as surety for its faithful execution. This proposition was accepted by the Commission and the work was satisfactorily completed under a contract made in pursuance of this agreement.

In January, 1910, the Blackstaff Engineering Co., Incorporated, of Philadelphia, was awarded a contract for the construction of Section F, Beargrass Intercepter. After several months of progress, below the requirements of the contract, due somewhat to financial difficulties, the company abandoned the contract about the middle of July, 1910, claiming that the conditions encountered were not such as were indicated by the contract drawings.

Early in September following the Commission re-advertised the work and re-let the same to the Henry Bickel Company, at a loss of some $20,000. The work was expeditiously and satisfactorily completed by the Henry Bickel Company upon the original plans and specifications, and the Commission brought suit against the Blackstaff Engineering Co. to recover the difference between its bid and the bid of the Henry Bickel Company and against the surety, the Fidelity & Deposit Company of Maryland, to recover $8,000, the amount of the bond. In this suit both the lower and higher courts upheld the Commission and awarded judgment in the full amounts claimed by the Commission against both the contractor and surety.

Work Done by Day-Labor.

The Commission at the outset organized an Engineering Department so that all of the engineering has been done by the employes of the Commission. In connection with this work it was necessary to employ a small day-labor force during the earlier years of the work for the purpose of making borings and assisting upon engineering investigations.

In 1909, it was found necessary to make material changes in the plans for the outlet structure of the Northwestern Sewer. This structure was to have been built as a part of Contract No. 42, but it was found that the foundations were not satisfactory in the location selected for this structure at the time the contract was awarded, which was the reason for the change in plans. After the new plans were prepared the contractor was asked to make a proposal for completing the work according to the revised plans. The estimated expense of completing this work in accordance with the contractor's new proposal was $58,433.35, while the Engineer's estimate of the cost of this work was $42,489.22. The contractor gave as the reason for making such high figures the fact that this work being located on the river bank was unusually hazardous because of the danger of frequent rises in the river, necessitating a temporary abandonment of the work, and other difficulties likely to be encountered in this location, including a very large flow of ground water which would require expensive pumping and might render excavation and timbering very expensive. Careful consideration was given to the advisability of re-advertising the work and securing new tenders, but it was believed that such bids would be very high on account of the hazardous nature of the work. The Chief Engineer, therefore, recommended that the work be done by day-labor under authority of Section Nine of the Act of 1906, in which recommendation the Consulting Engineer concurred.

The Commission acting in accordance with this recommendation authorized that the work involved in this contract be completed by day-labor, and accordingly the day-labor organization was increased, machinery, tools and supplies were purchased, and the work was done under the direction of the engineer in charge of the Northwestern Division, at a cost of $41,850.13.

In the summer of 1910, it was felt that the bids received for the construction of a sewer in Oak Street, Section B, were unreasonably high, and the Commission, acting upon the recommendation of the Chief Engineer, decided to have this work done by day-labor. Subsequently the Commission authorized also the construction of the sewer in Eighth and St. Catherine Streets to be built by day-labor for the same reason. Subsequent to 1910, there were quite a number of relatively small pieces of work involving difficulties, in some cases not easy to anticipate, which it seemed wise to the Chief Engineer to do by day-labor, and acting upon his recommendation the Commission authorized that this work be done in that manner. The day-labor force was, therefore, organized to carry on such work, for which proposals were felt to be unreasonably high, hazardous undertakings, and the small odds and ends, like the construction of regulators, inlets and catch-basins.

During the year 1911, bids were received for the construction of Section D, Middle Fork Sewer. As these bids exceeded the Engineer's preliminary estimate by a substantial percentage, it was felt that this work should be undertaken by day-labor.

In 1911, work was begun upon the improvement of Beargrass Creek. As this construction must be carried on in the bed of Beargrass Creek, a stream which rises very quickly in times of rain, it was felt that judicious contractors would be obliged to make their proposals high because of the risk of being flooded and having partially completed work damaged at frequent intervals. The Chief Engineer, therefore, recommended to the Commission that it was wiser for the Commission to carry the risk than to pay the contractor for carrying it, and that the work be done by day-labor. The organization has, therefore, carried this work to completion during the last year.

During the earlier years, when the work was first undertaken by day-labor, it was handled by the Division Engineers in whose division it happened to be located. In 1911, as the amount of contract work was gradually decreasing, the organization was re-arranged, all the contract work being put first in the hands of Mr. H. S. Morse, formerly in charge of the Eastern Division, and later in the hands of the Designing Engineer, Mr. J. H. Kimball, and all of the day-labor force being put under the direction of Mr. F. C. Williams, formerly in charge of the work on the Southern Division, under whost direction the improvement of Beargrass Creek has been brought to completion.

The fact that the work of the Commission would terminate in the near future has been kept constantly in mind in securing equipment with which to do the day-labor work, and an effort has been made to purchase only such machinery for each undertaking as was warranted by the work which was to be done rather than with a view of using such machinery on other work in the future, as would be possible were the activities of the Commission to be continued indefinitely. The cost of all machinery purchased has been charged to the work upon which it has been used.

TABLE NO. 4.

ENGINEER'S ESTIMATES, PROPOSALS AND COST OF WORK DONE BY DAY-LABOR.

Number	Name of Sewer	Amount of Lowest Proposal	Engineer's Preliminary Estimate of Cost of Work Included in Proposal	Cost of Work Done Under Items Included in Proposal		Engineer's Preliminary Estimate of Total Cost of Work	Administration, Engineering, Rights of Way, Incidentals	Total Cost of Completed Work
				Calculated at Prices in Proposal	Actual Cost by Day-Labor			
42	Sec. A—Northwestern Sewer	$58,433 35	$42,489 22	$58,433 35	$41,681 46	$49,075 05	$6,329 25	$48,010 71
71	Sec. B—Oak Street	36,771 06	27,143 48	37,955 84	30,435 70	31,350 72	2,772 66	33,208 36
75	Eighth and St. Catherine Sts.	44,404 20	34,357 16	45,144 51	30,764 33	39,682 52	9,905 54	40,669 87
82	Sec. D—Middle Fork Sewer	19,329 85	15,033 47	19,935 75	18,804 41	17,363 66	7,040 90	25,845 31
				$161,469 45	$121,685 90			$147,734 25

COST OF CONNECTIONS MADE TO THE BEARGRASS INTERCEPTER.

Webster St.	$ 9,504 00
Cooper St.	3,504 56
Green St.	1,361 16
Phoenix Hill	4,030 26
Brent St. and Broadway	6,612 44
Dry Run	3,444 11
Snead's Branch	1,212 49
Southeastern	11,938 11
Enterprise (To Middle Fork Sewer)	4,322 18
	$45,929 31

IMPROVEMENT OF THE CHANNEL OF BEARGRASS CREEK.

Sec. A	$17,983 24
Sec. B	32,228 90
Sec. C	55,056 35
Sec. D	43,519 35
	$148,787 84

MISCELLANEOUS SEWER CONSTRUCTION.

Sec. A—Central Ave.	$ 8,811 01
O St.	1,338 91
Oak St. from Fourth Street westerly	1,215 17
York St.	10,593 81
Sec. B—Second St.	8,295 60
Sec. B—Northeastern Storm Drain	7,826 62
Catch Basins	21,215 53
	$59,296 65

Grand Total Day-Labor Work, $401,748.05.

In Table 4 are given the Engineer's estimates, the proposals and the cost of work done by day-labor for projects undertaken. The total cost of work done by day-labor was $401,748.05, or 9.5 per cent. of the total expenditures of the Commission. Three of the projects were advertised and the lowest bids received are given in column 3 of this table, as is also the estimated cost of completing Section A, Northwestern Sewer based upon the tender of the contractor who began the work. In column 5 of this table are given the calculated cost of each of the four sewers for which proposals were received, based upon the prices named in the lowest proposals. The items in this column vary from those in column 3 as the quantity of the work under the several items was increased or decreased above or below the quantities upon which the proposals were based. In column 6 is given the actual cost of doing by day-labor that portion of the work covered by the proposals. In column 7 is given the Engineer's preliminary estimate of the total cost of the work, while in column 8 is given the cost of administration, engineering and incidentals, and in column 9, the total cost of the completed work.

From an examination of the figures given in Table 4, it will be seen that a material saving resulted from doing by day-labor the work covered by Contracts No. 42, 71 and 75. The contract for Section D, Middle Fork Sewer, No. 82, cost substantially the same as the lowest bid, very little saving resulting from doing this work by day-labor. Taking these four contracts together, the total saving was $39,783.55.

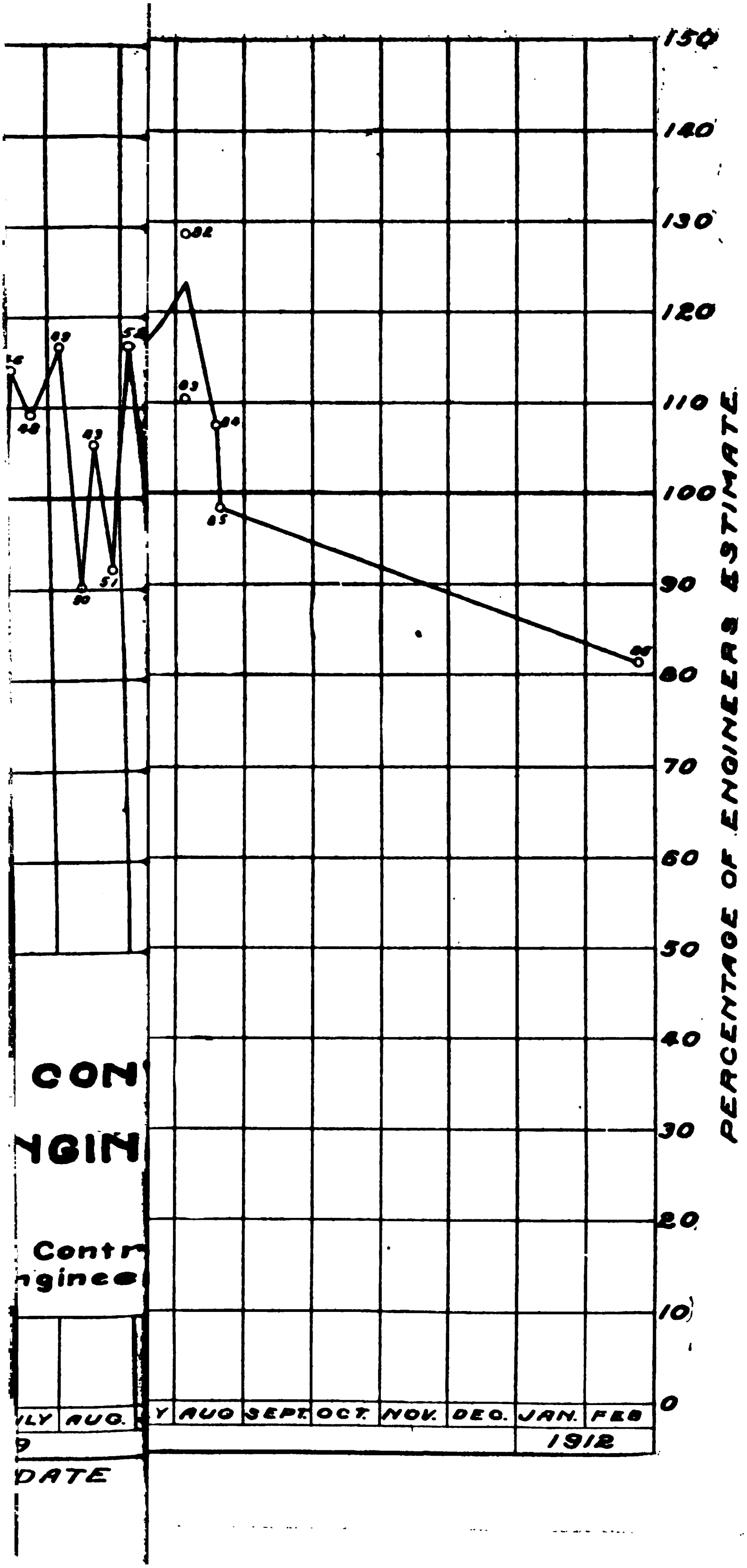
The general results of building those sewers and other structures by day-labor rather than by contract have been satisfactory. It is not possible to compare the cost in all cases with bids because the work was of such a nature that it was not practicable to secure tenders for doing it. It is believed, however, that the results indicated by the saving upon those projects upon which bids were received is indicative of the saving effected on the other work.

Current Prices.

Preliminary estimates of the cost of the work covered by the various contracts have been made prior to the time when bids were received. While the bases of these estimates doubtless varied from time to time, depending on market conditions, price of labor, and the tendency of contractors to bid higher or lower than previously, it is believed that these variations have not been large. Diagram A shows graphically the relation between the Engineer's estimates and the lowest bids received. It will be noticed that during 1907, 1908 and the first six months in 1909, the proposals were almost invariably below the Engineer's estimates. During the latter part of 1909, there was a decided tendency toward an increase in contract prices with reference to the Engineer's estimates, and in 1910 and 1911, the prices were materially higher than the estimates. This decided tendency toward higher prices led to the decision to do some of the work by day-labor in cases where the tenders were materially in excess of the Engineer's estimate. The Commission hesitated to take this step, however, and delayed doing so hoping that contract prices would more nearly approach the Engineer's estimates.

There has been a feeling in certain circles that contractors upon the Commission's work have in a good many cases failed to make a reasonable profit and that some have lost considerable sums of money.

It appears to be true that the standard of workmanship required upon these sewers was materially better than that which has been required in work of a similar character in this part of the country. It was considered necessary to build the structures not only in a substantial manner but to secure a smooth finish, which enables the sewers to carry the greatest amount of sewage. This policy was established at the outset and the contracts were drawn with the greatest care to make perfectly clear the character of workmanship which was to be required, so that the bidders were fully advised as to the nature of the work when they made up their proposals. In a number of cases the successful bidders ap-


150
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PERCENTAGE OF ENGINEERS ESTIMATE
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OCT.
NOV.
DEC.
JAN.
FEB
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1912
DATE
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83
84
85

parently thought that the requirements of the contract would not be enforced. This, however, was not the case and every effort has been taken to secure the character of workmanship specified in the contracts.

When the first bids were made, the current prices of labor were relatively low, the minimum price paid for any considerable amount of labor in 1907 and 1908 being $1.35 per day. There has been a decided tendency toward an increase in the price of labor so that it is doubtful if any material amount of labor has been obtained in the last three years for less than $1.75 per day, and there have been many cases where the labor has cost as high as $2.00 per day.

The prices of materials have not varied as much as the price of labor although there has been a tendency toward an increase in price during the period covered by this work.

One possible explanation for the fact that the earlier bids were relatively low is that most of the bidders were not experienced sewer contractors but had gained their experience upon very different undertakings, such as the erection of buildings, railroad and other work. Furthermore, most of the earlier bids were received from contractors who were not familiar with local conditions and who came from outside the city. It is an interesting fact that in Louisville during the twenty years prior to 1906, but one large masonry sewer had been built, that known as the Southeastern Sewer, so that there were no local contractors at the time this work was commenced familiar with this class of construction. It is of further interest to note that no sewers had been built of concrete in this city prior to the work of this Commission.

Work Done.

The Commission early decided that it was wise to expend the fund resulting from the sale of these bonds, or the most of it, for the construction of large trunk lines and to leave the construction of small lateral sewers to be paid for from the annual appropriations of the city. It naturally follows, therefore, that the number of miles of sewers built by the Commission is much less than would have been the case had the funds been expended for the small and relatively inexpensive sewers.

The total length of sewers constructed by the Commission is 54.05 miles, making the total length of sewers built in the city to September 1, 1912, 177.56 miles. In Table 5 is given the length of each size of the sewers and drains constructed by the Commission.

TABLE NO. 5.

LENGTH OF SEWERS AND DRAINS CONSTRUCTED BY COMMISSIONERS OF SEWERAGE.

Size In.	Length Ft.	Size In.	Length Ft.	Size Ft. In.	Length Ft.	Size Ft. In.	Length Ft.	Size Ft. In.	Length Ft.
8	27,640	33	12,954	5 —0	10,114	7 —3	4,744	12 —3	2,016
10	10,068	36	13,076	5 —1	2,025	7 —8	1,974	13 —0	1,353
12	7,107	39	10,445	5 —2	7,524	8 —0	1,395	13 —6	3,720
15	7,637	42	8,902	5 —6	6,447	8 —3	1,718	13 —9	712
16	59	45	2,473	5 —8	2,168	9 —0	824	14 —0	4,279
18	16,665	48	7,452	6 —0	2,787	9 —6	7,819	14 —3	965
20	9,346	49	5,613	6 —3	836	10 —0	3,836	15 —0	1,841
22	7,310	51	2,291	6 —6	2,908	10 —6	1,101	15 —6	3,337
24	12,575	52	1,104	6 —8	432	10 —7	1,900	3 —0 x2 —0 varying to 6 —0 x4 —9	4,210
27	6,163	54	6,262	6 —9	3,626	11 —3	3,538		
30	11,966	57	1,424	7 —0	2,880	12 —0	3,814		

Total, 285,378 linear feet, or 54.05 miles.

Upon the accompanying map is shown the sewers built by the Commission and the sewers built by the city, as well as the districts drained. In examining the map it should be remembered that the areas drained by the sewers built by the Commission are served in many cases only by the main trunk lines and that these districts are not fully provided with lateral sewers. Such sewers, however, can be built from time to time as the necessities of the communities require.

The location and description of each sewer constructed by the Commission is given in Appendix C.

In the report of 1910, a detailed description of the contracts then completed or well under way was given and this work is not described in the present report. A detailed description of the several contracts completed since 1910 report was issued is given in Part Two of this report.

SOUTHERN OUTFALL.—The most important and the largest single project undertaken by the Commission was the construction of the Southern Outfall. This outfall was completed in September, 1910, the last section finished being that known as Section "D," the closure being made at the intersection of Wilson Avenue and Fifteenth Street. This sewer extends from a point on the Ohio River, one mile below the foot of Broadway to the intersection of Avery Avenue and Brook Street, a distance of 5.2 miles. The size varies from 15 feet 6 inches in diameter to 7 feet in diameter and it will drain an area of about 4,600 acres, the greater portion of which is now within the city limits. It has cost about $1,212,860.70.

Soon after the completion of the Southern Outfall, and before it was put into use, the Commission provided for lighting, by electricity, for exhibition about one-half mile of the interior of the sewer in and near the State Fair Grounds on September 19 and 20, 1910, when the public was invited to view this portion of the Outfall. In response to this invitation, the sewer was inspected by his Honor, Mayor W. O. Head, representatives of the Board of Public Works and the Board of Public Safety, and members of the Commercial Club and the Board of Trade and many other citizens.

As soon as the Outfall was completed the work of connecting the existing sewers in its drainage area was begun and between September 24 and December 6, 1910, connections were made with several sewers in the Western Outfall and Dry Run basins, thus putting in service the sewers previously built by the Commission for the relief of these districts. Such connections were made at Twenty-third Street and Ormsby Avenue, Eighteenth Street, and St. Louis Avenue, Fifteenth Street and Ormsby Avenue and Twelfth and Breckinridge Streets.

The connection at Twenty-third Street provides for the discharge into the Southern Outfall of the drainage from the very narrow district lying on either side of Ormsby Avenue between Twenty-third Street and Fifteenth Street.

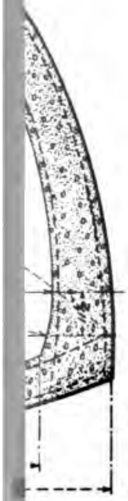
The connection at Eighteenth Street and St. Louis Avenue together with the construction of the sewer in Twenty-first Street and Bolling Avenue provide for the drainage into the Southern Outfall of a considerable area south of it, the drainage from a part of which formerly found its way into the Western Outfall.

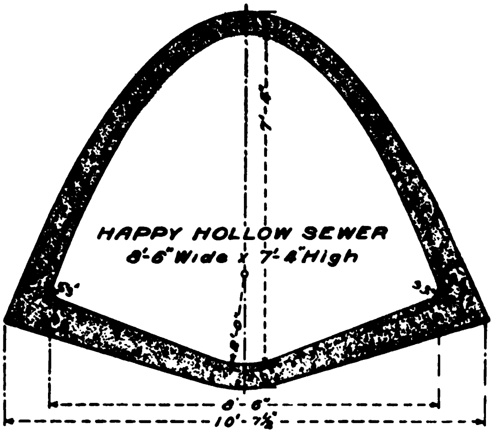
The Fifteenth Street connection provides for diverting the flow from a large district extending as far easterly as Ormsby Avenue and Garvin Place from the Western Outfall into the Southern Outfall.

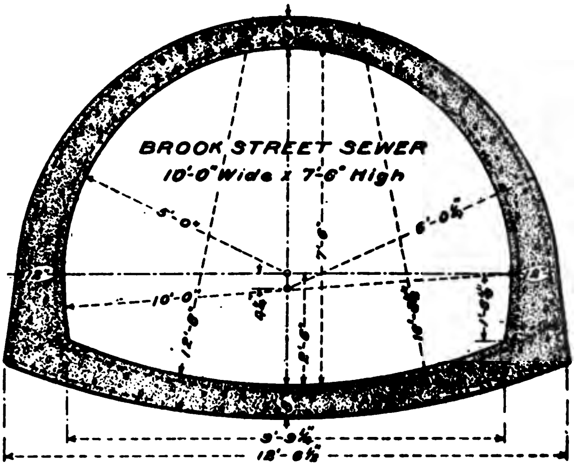
The connection of the Western Outfall in Breckinridge Street at Twelfth Street with the new sewer in Twelfth Street and the building of the Oak Street and the Eighth Street and St. Catherine Street sewers provide for the diversion of the drainage from the upper end of the Western Outfall basin and a portion of that from the Dry Run Basin into the Southern Outfall. This area extends as far north as Green and Ninth Streets, as far east as Fourth and York Streets and Third and St. Catherine Streets, and as far south as Third and Park Avenue. The greater portion of this area constitutes the largest single area transferred from the Western Outfall basin to the drainage area of the new Southern Outfall, and is one which has suffered greatly in the past from flooding.

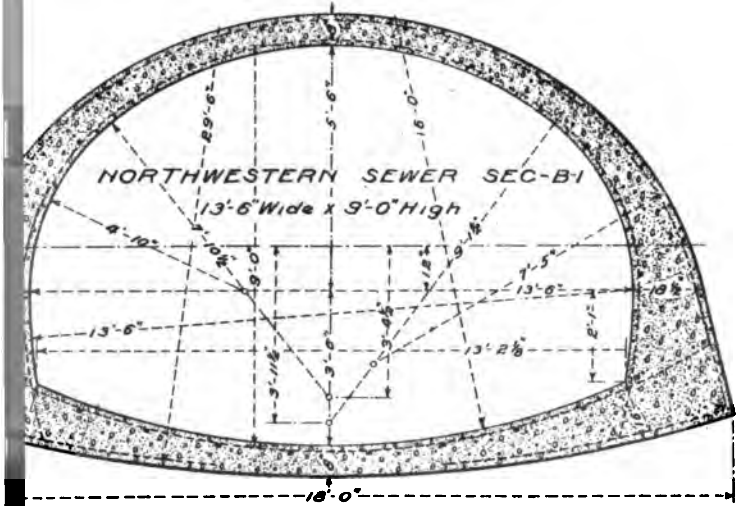
The sewer built in Hill Street, from the Southern Outfall at Ninth Street to the Louisville & Nashville Railroad underpass, provides for diverting the drainage from the upper portion of the Dry Run basin extending as far east as Fourth Street.

PLATE A.




HAPPY HOLLOW SEWER
8'-6" Wide x 7'-4" High
7'-4"
2'-9"
8'-6"
10'-7½"


BROOK STREET SEWER
10'-0" Wide x 7'-6" High
5'-0"
6'-0¼"
7'-6"
10'-0"
12'-6"
2'-6"
9'-3⅝"
12'-6½"


NORTHWESTERN SEWER SEC-B-1
13'-6" Wide x 9'-0" High
29'-6"
5'-6"
16'-0"
4'-10"
7'-10½"
9'-0"
9'-1½"
7'-5"
13'-6"
18½"
13'-6"
3'-4½"
13'-2⅞"
2'-1"
3'-11⅛"
3'-6"
18'-0"

The Dry Run Basin has been further relieved by building a sewer in Third Street from the Southern Outfall in Avery Avenue to A Street where the Dry Run sewer was cut off and connected with it, and in Second Street from the Southern Outfall in Avery Avenue to Magnolia Avenue, and in Magnolia Avenue to the alley west of Second Street. These relief sewers provide for extending the boundaries of the Southern Outfall basin to include the area adjacent to Third Street between Avery Avenue and Park Avenue and that adjacent to Second Street as far north as Oak Street. Other minor connections have been made by means of which all the drainage south of Avery Avenue has been diverted from the Dry Run sewer to the Southern Outfall. These various connections have lessened the burden on the Dry Run sewer and have provided an outlet into the Southern Outfall for that part of the system lying above the points of connection, relieving the laterals in this territory from the effect of freshets in the South Fork of Beargrass Creek.

The Southern Outfall is now receiving the drainage from 900 acres, previously drained into the Dry Run sewer, and 1,174 acres formerly draining into the Western Outfall system. It also receives the dry weather flow of sewage from the Western Outfall and from the Northwestern Trunk Sewer, which is intercepted and conveyed by the Western Intercepter.

SOUTH LOUISVILLE BRANCH SEWER.—This, the most important branch of the Southern Outfall, extends from a point near the intersection of Avery Avenue and Seventh Street extended, through South Louisville to the southern city boundary line at Oakdale. This sewer is of the proper size to drain South Louisville and such adjoining territory as may be expected to become a part of the city in the near future. This makes possible the construction of numerous laterals required to serve this district.

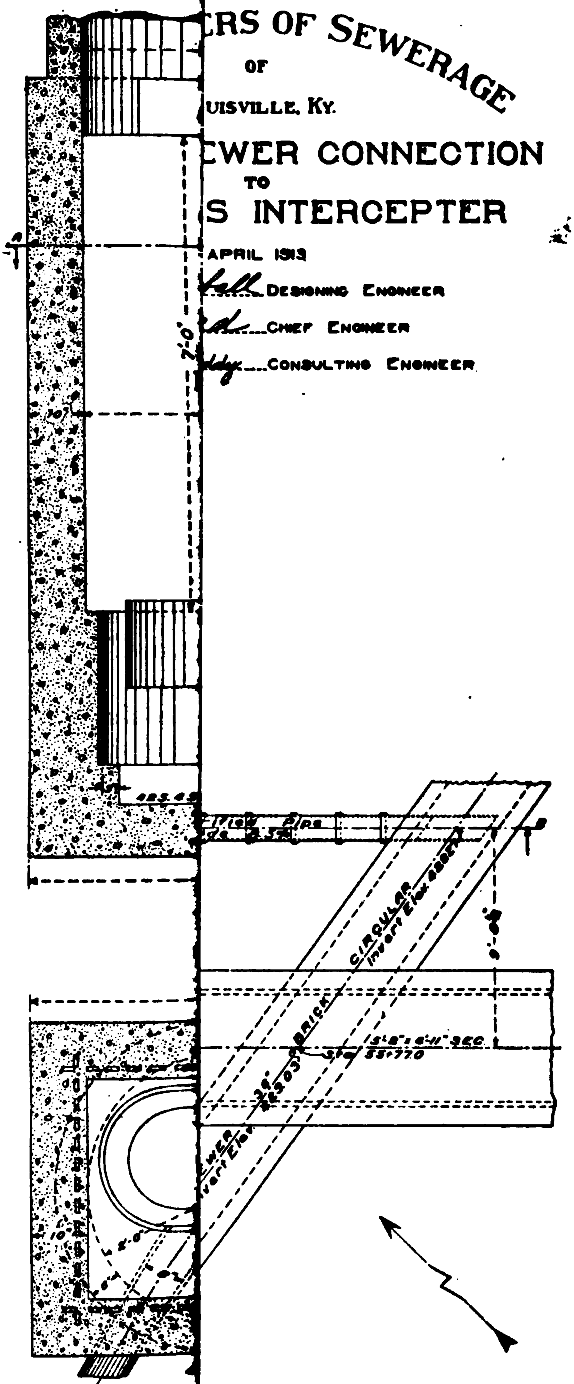
The Commission has built two lateral sewers in this district, one in Central Avenue from Fourth Street eastwardly to the shops of the Louisville & Nashville Railroad, with a branch southwardly in Third Street to the present city limits; the other in O Street from Seventh Street to Sixth Street.

BROOK STREET SEWER.—Another important branch of the Southern Outfall has been built out Brook Street from Avery Avenue to a point in Floyd Street immediately beyond the city limits where the Dry Run enters the city. This sewer is 5,172 feet in length and 7½ by 10 feet in size. It is designed to take the sewage and storm flow from the upper Dry Run Basin south of Avery Avenue. For the present it is connected with the Southern Outfall but it is intended that ultimately only the dry weather flow will be discharged into the Southern Outfall, the storm flow to be conducted to Beargrass Creek by an Overflow Drain to be constructed from a point at the junction of Brook Street and Avery Avenue to Beargrass Creek at a point a short distance north of Kentucky Street. Before this Overflow Drain is built, which should be in the near future, Beargrass Creek should be improved and lowered in accordance with the report upon the "Improvement of Beargrass Creek," embodied in the report of the Commission issued in 1910.

BEARGRASS CREEK INTERCEPTER AND CONNECTIONS.—The Beargrass Creek Intercepter, extending from the Ohio River at a point near the foot of Campbell Street extended to a point near the South Fork of Beargrass Creek in St. Michael's Cemetery, a distance of about 3.38 miles, was completed in 1911. The Intercepter varies in size from six feet six inches by six feet one and one-half inches to thirty-three inches in diameter and is designed to receive ultimately the dry weather flow of sewage from 7,829 acres. The Northeastern Sewer, designed to receive the sewage from the Crescent Hill district, and the Middle Fork Sewer, designed to receive the sewage from the south side of Crescent Hill and the northerly side of the Highlands, discharge into the Intercepter. All of the other sewers draining the area of the South Fork of Beargrass Creek were built upon the combined system and excepting the Baxter Avenue Sewer and a small sewer in Schiller Avenue have been so connected, with

PLATE B.

RS OF SEWERAGE
OF
UISVILLE, KY.
EWER CONNECTION
TO
S INTERCEPTER
APRIL 1913
DESIGNING ENGINEER
CHIEF ENGINEER
CONSULTING ENGINEER



the Intercepter, that the dry weather flow and a portion of the storm flow will be discharged into it. These connections have been provided with automatic gates opened and closed by means of floats which rise and fall as the height of water in the Intercepter rises and falls. As the Intercepter becomes full the gates in the regulators gradually close so that the surplus flow in the old trunk sewers is diverted into Beargrass Creek.

The Intercepter is located on the westerly side of Beargrass Creek and is in a general way parallel with the main stem of the creek and the South Fork. The Intercepter diverges from the creek at a point near Main Street, taking a more direct course to the river.

As many of the combined trunk sewers discharge into the creek from the easterly side, it has been necessary to provide connections from these sewers to the Intercepter below the bed of the creek, some of which have of necessity been in the form of inverted siphons.

Two types of regulators have been used upon this work, the larger being illustrated by the drawing Plate B of the regulator installed on the Green Street Sewer. The regulator is placed in an underground masonry chamber and consists of a gate carried on one end of a lever to the other end of which is attached a float. The float chamber is connected with the intercepting sewer by means of a small pipe so that the sewage rises and falls in the float chamber in unison with the rise and fall of the sewage in the intercepting sewer. As the float rises the gate is closed and vice versa as the float falls the gate is opened.

The smaller type of regulator is illustrated by the drawing of the regulator installed upon the Cooper Street Sewer, Plate C. This regulator is similar in principle to the one already described, the main difference being that a smaller spherical float is used to control the opening and closing of the gate and this float rides upon the sewage in the manhole upon the branch sewer, the height of the sewage being controlled by the height of the sewage in the Intercepter through the main connection, no special float chamber being provided for it.

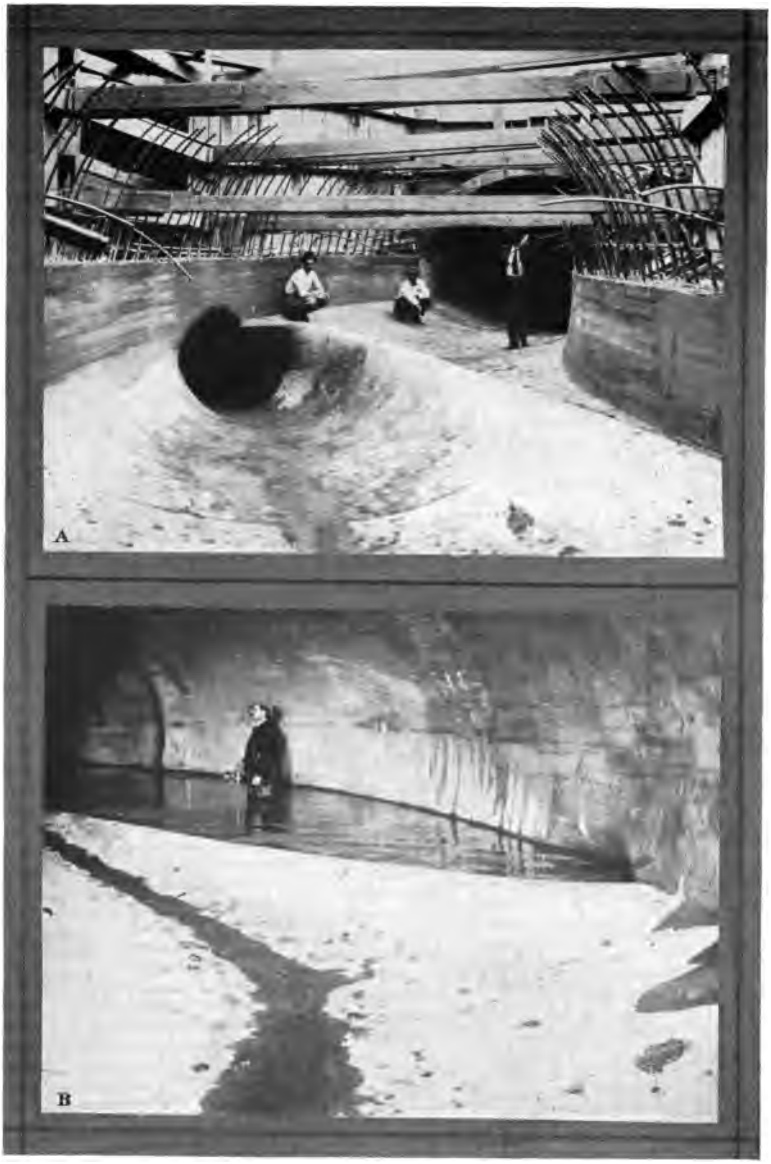
NORTHEASTERN SANITARY SEWER.—The northeasterly portion of the city in the vicinity of Crescent Hill has been sewered upon a double system, by which is meant that sewers have been provided to receive the sewage and that storm drains, independent of the sewers, have been provided to conduct the storm water to the nearest water course.

The trunk sewer connects with the Beargrass Intercepter at a point in Mill Street immediately north of the Louisville & Nashville Railroad tracks, and extends in an easterly direction through the Cut-off Embankment and under Beargrass Creek by means of an inverted siphon, and thence in a generally easterly direction in or near Letterle Avenue to the Crescent Hill district. Lateral sewers connecting with the trunk sewer have been provided to serve the streets now constructed in this district.

Storm drains have been built from the Edwards Pond Branch in or near Jane Street and Vernon, Ewing, Aubin and Crescent Avenues, to provide outlets for the storm water from this district.

IMPROVEMENT OF OLD BED OF BEARGRASS CREEK.—The report of the Board of Engineers recommended the construction of a drain along the old bed of Beargrass Creek. It was found economical to construct this drain in connection with the Northeastern Sanitary Sewer, as described in considerable detail in the report of 1910. This drain was connected with the existing gate and culvert through the Cut-off embankment and extends from that point in a westerly direction, following approximately the old bed of Beargrass Creek, to a point in Campbell Street just north of the Louisville & Nashville Railroad tracks. Throughout the greater portion of its length, it is the lower portion of a two-story concrete structure built upon a pile foundation. The drain grades in an easterly direction toward the Cut-off embankment while the sewer above it grades in a westerly direction toward the Beargrass Intercepter.

MIDDLE FORK SEWER.—This trunk sewer has been built in that portion of the Middle Fork drainage area which is within the city limits and serves district which may be desig-



Diversion Chamber at junction of Northwestern sewer and Western intercepter. A—Looking down stream. B—Looking up stream.

nated as the south side of Crescent Hill and the north side of the Highlands. This district is designed to be sewered by the separate system. The Middle Fork Sewer connects with the Beargrass Intercepter at a point near the junction of the Middle and South Forks of Beargrass Creek and extends in an easterly direction along the Middle Fork to a point in Cherokee Park. Three main branches have been constructed, the most northerly being the sewer in Long Avenue, the central one passing through Cherokee Park to Bonnycastle, Alta and Sherwood Avenues, and the southerly branch connecting with the Enterprise Trunk Sewer by means of a regulator, this sewer having been built to receive both sewage and storm water. Another important branch of the Middle Fork Sewer extends through Cave Hill Cemetery in a southerly direction to Transit Avenue and serves a well built up district in this vicinity just west of the cemetery. Parallel to this branch a storm drain was constructed which discharges into the Middle Fork of Beargrass Creek at a point near the Workhouse property.

NORTHWESTERN SEWER.—This sewer extends from the Ohio River at Shawnee Park to Nineteenth Street, a distance of 2.88 miles. It varies in size from thirteen feet six inches wide by nine feet high to a circular sewer five feet in diameter. This sewer provides for the ultimate drainage of the northwestern portion of the city lying in a general way between Madison Street on the south and Bank Street on the north and between Twenty-sixth and Twenty-eighth Streets on the east and the Western Parkway on the west. The district between Twenty-sixth and Fifteenth Streets, formerly draining into the Western Outfall, has been transferred to the drainage area of this sewer, thus furnishing further relief to the Western Outfall.

While the main outlet of this sewer is located on the bank of the Ohio River in Shawnee Park, the dry weather flow will be diverted to the Southern Outfall, only the storm flow passing out through this outlet into the river.

WESTERN INTERCEPTER.—An intercepting sewer has been constructed from the Southern Outfall at a point in the Kentucky State Fair Grounds to the Northwestern Sewer in Shawnee Park. The intercepter is five feet in diameter at its lowest end and three feet six inches in diameter at its upper end. It passes under the Western Outfall in Broadway at which point it receives the dry weather flow from this outfall through an automatic regulator. The dry weather flow in the Northwestern Sewer is diverted into the the Western Intercepter. This Intercepter thus prevents the discharge of sewage into the Ohio River in the vicinity of Shawnee Park.

THIRTY-FOURTH STREET OUTLET.—A portion of the old Thirty-fourth Street Sewer, extending from the Ohio River at the foot of Thirty-fourth Street to a point a short distance south of Water Street, has been in an unsatisfactory and more or less dangerous condition for a number of years due to deformation caused by the pressure of the earth on the boiler plate structure. At the urgent request of the Board of Public Works, the Commission undertook to rebuild this portion of the Thirty-fourth Street Sewer, although this work was not included in the original plans of the Commission. The rebuilding of this outlet was described in detail in the report of 1910. A new structure was built parallel to and on the westerly side of the old sewer and was extended about 125 feet further out into the river, thus providing a submerged outlet in place of the old outlet discharging on to the river bank above the water at all ordinary stages of the river. This work cost $43,531.45 and is the only work of reconstruction or repair of existing sewers which has been done by the Commission.

RELIEF SEWERS.—One of the problems presented to the Board of Engineers when appointed in 1906 was that of providing relief for a large number of existing sewers which were found to be overtaxed at times of heavy rainfall. Suggestions were made in its report for the construction of a number of relief sewers which should supplement existing sewers and thus furnish a greater opportunity for disposing of surplus water, but the most important steps toward furnishing relief were the diversion of a large portion of the run-off then draining into the Western Outfall into the proposed Southern Outfall and a similar diversion of the flow of the upper part of Dry Run temporarily into the Southern Outfall.

At that time the drainage area tributary to the Western Outfall was 4,037 acres, of which 1,200 acres have been made tributary to the Southern Outfall and 1,440 acres to the Northwestern Sewer. The present drainage area of the Western Outfall is 1,400 acres.

In 1906, the area drainage into the Dry Run Sewer was 3,880 acres, of which 900 acres have now been made to drain into the Southern Outfall. As pointed out elsewhere, however, 1,990 acres of the area now tributary to Brook Street at the intersection of Avery Avenue are intended to be served by the Southern Outfall only until such time as the Overflow Drain from this point to Beargrass Creek shall have been constructed, although the dry weather flow of sewage will continue to flow through the Southern Outfall.

Trouble had been experienced with flooding in Green Street, now Fehr Avenue, between Shelby and Garden Streets. This sewer district was served by a trunk sewer in Green Street discharging into Beargrass Creek. Its drainage area was 109 acres and extended north and south of Green Street and westerly from Baxter Avenue to Hancock Street. Relief has been afforded this district by the construction of a new sewer in Green Street from Garden Street to Shelby Street, parallel with the old sewer, with suitable connections to the existing system.

For a number of years past, considerable trouble has been experienced with flooding in the vicinity of the intersection of Rubel Avenue and Breckinridge Street. This locality had been served by the Highland Avenue Sewer discharging into Beargrass Creek at the foot of Brent Street south of Broadway. Relief has been afforded this district by building a new sewer from the Southeastern Trunk Sewer, which discharges into Beargrass Creek at a point opposite the foot of Rufer Avenue, if extended, in Brent Street, Page Street, Barret Avenue and Christy Avenue to the intersection of Christy and Rubel Avenues. The drainage area naturally tributary to this sewer will be 46 acres. In addition to the yield from this area, the storm flow from 47 acres still tributary to the Highland Avenue Sewer will overflow into this Barret Avenue Sewer, although the dry weather flow and some storm flow from this area will pass down the Highland Avenue Sewer as formerly.

While the principal object of building the relief sewers has been to afford better drainage for the districts which were flooded at times of severe storms, the sewers have been built in all cases, except those in Green Street from Garden Street to Shelby Street, in York Street from Sixth Street to Seventh Street, in York Street from Fourth Street to Fifth Street, in Eighth Street from Oak Street to St. Catherine Street, in St. Catherine Street from Third Street to Sixth Street, in Oak Street from Seventh Street to Eighth Street, in Third Street from A Street to Brandeis Avenue, and in Second Street from A to Lee Streets and from Burnett Avenue to Magnolia Avenue, so that they will serve as laterals as well as relief sewers and thus provide new sewerage for the districts through which the sewers extend. The names and locations of the relief sewers are given in Table 6:

TABLE NO. 6.

TABLE OF RELIEF SEWERS BUILT BY THE COMMISSIONERS OF SEWERAGE.

	From	To
Twelfth St.	Wilson Ave.	Breckinridge St.
Twenty-ninth St.	Broadway	Walnut St.
Chestnut St.	Twenty-ninth St.	Twenty-eighth St.
Nineteenth St.	Cedar St.	Broadway.
Madison St.	Twentieth St.	Twenty-third St.
Walnut St.	Eleventh St.	Thirteenth St.
Walnut St.	Twentieth St.	Twenty-third St.
Cedar St.	Twenty-eighth St.	Nineteenth St.
Twenty-first St.	Cedar St.	Jefferson St.
Jefferson St.	Twenty-first St.	Twenty-third St.
Sixteenth St.	Breckinridge St.	Anderson St.
Broadway	Twenty-sixth St.	Twenty-second St.
Broadway	Ninth St.	Sixth St.

TABLE NO. 6—Continued.

	From	To
Elliott Ave.	Twenty-sixth St.	Twenty-fourth St.
Magazine St.	Twenty-sixth St.	Twenty-fourth St.
Ninth St.	York St.	Breckinridge St.
Breckinridge St.	Ninth St.	Sixth St.
Twenty-first St.	St. Louis Ave.	Bolling Ave.
Bolling Ave.	Twenty-first St.	Lane East of McCloskey Ave.
Dumesnil St.	Fifteenth St.	Sixteenth St.
Sixteenth St.	Dumesnil St.	Oak St.
Oak St.	Sixteenth St.	Seventeenth St. on the north.
Fifteenth St.	Wilson Ave.	Ormsby Ave.
Twenty-third St.	St. Louis Ave.	Ormsby Ave.
Third St.	A St.	K St.
Oak St.	Seventh St.	Fourteenth St.
Eighth St.	Oak St.	St. Catherine St.
St. Catherine St.	Eighth St.	Third St.
Seventh St.	Hill St.	Magnolia Ave.
Hill St.	Ninth St.	Alley west of Sixth St.
Clay St.	Ormsby Ave.	Guendaline Ave.
High Ave.	Twenty-sixth St.	Twenty-fourth St.
Twenty-fourth St.	High Ave.	Bank St.
Twenty-fifth St.	Bank St.	Jefferson St.
Jefferson St.	Twenty-fifth St.	Twenty-fourth St.
Twenty-fourth St.	Jefferson St.	Alley south of Madison St.
Hoertz Ave.	Goss Ave.	Forest St.
Green St.	Garden St.	Shelby St.
Brent St.	Rufer Ave. (if ext'd)	Page St.
Page St.	Vine St.	Barret Ave.
Barret Ave.	Highland Ave.	Christy Ave.
Christy Ave.	Barret Ave.	Rubel Ave.
Dumesnil St.	Thirty-second St.	Beech St.
Oak St.	Fourth St.	Alley west of Fourth St.
York St.	Seventh St.	Sixth St.
York St.	Fifth St.	Fourth St.
Fourth St.	York St.	York St. southerly.

LATERALS.—In the original report of the Board of Engineers, it was suggested that after building the trunk and relief sewers very urgently required, there might be a relatively small balance of the funds in the hands of the Commission which would be available for extending lateral sewers into unsewered districts. While the policy of the Commission has been to expend its funds primarily upon large and expensive sewers, which could be built from the tax levy only with great difficulty and very slowly, it has devoted a portion of its funds to the construction of lateral sewers in accordance with the original report. Such sewers and drains have been constructed in the Northeastern Sewer district, locally known as Crescent Hill; in the Middle Fork Sewer district, particularly in that portion lying southwest of Cave Hill Cemetery, and the Alta Avenue district, and has extended large laterals out Brook Street from Avery Avenue, as already described, and out Seventh Street to South Louisville, from which several branches have been constructed as well as numerous laterals in the Western Outfall basin. A list of these sewers is given in Table 7.

TABLE NO. 7.

LATERAL SEWERS BUILT BY COMMISSIONERS OF SEWERAGE.

	From	To
Transit Ave.	Cherokee Road	1,345 ft. northeast of center Willow St.
Everett Ave.	Dearing Court	Slaughter Ave.
Dearing Court	Everett Ave.	End of Court.
Willow St. Willow Ave.	Transit Ave.	Glenmary Ave.
Slaughter Ave.	Everett Ave.	Willow Ave.
Glenmary Ave.	Everett Ave.	Willow Ave.
Bismarck Ave.	Twenty-sixth St.	Twenty-eighth St.
Walnut St.	Twenty-sixth St.	Twenty-third St.
Madison St.	Twenty-fourth St.	Twenty-third St.
Aubin Ave.	Edwards Pond Branch	Field Ave.
Field Ave.	Aubin Ave.	Alley west of Bayly Ave.
Alley west of Bayly Ave.	Field Ave.	Frankfort Ave.
Bayly Ave.	Frankfort Ave.	Alley south of Frankfort Ave.
Crescent Ave.	Edwards Pond Branch	Frankfort Ave.

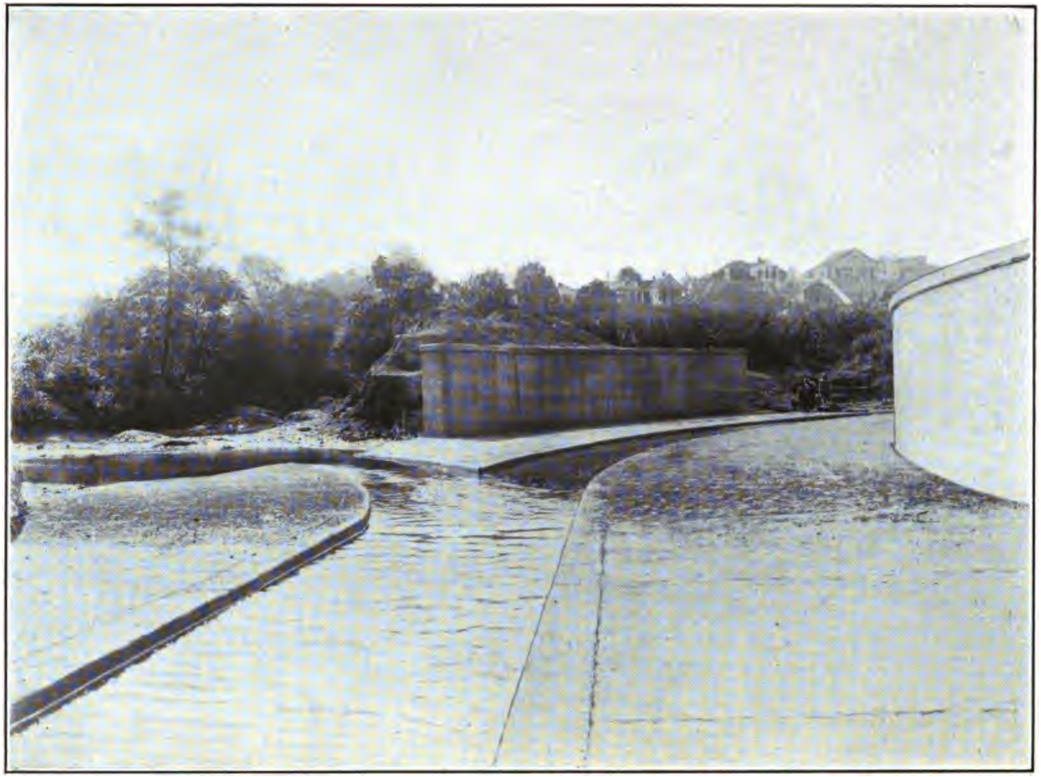
TABLE NO. 7—Continued.

	From	To
English Ave.	Crescent Ave.	500 ft. easterly.
Jane St.	Edwards Pond Branch	Frankfort Ave.
Keats Ave.	Frankfort Ave.	End of Keats Ave.
Alley north of Sycamore Ave.	Jane St.	110 ft. westerly.
Alley north of Frankfort Ave.	Jane St.	Keats Ave.
Sycamore Ave.	Jane St.	125 ft. westerly.
Galt Ave.	Frankfort Ave.	Payne St.
Vernon Ave.	90 ft. northeasterly from center Frankfort Ave.	1,570 ft. northeasterly from center of Frankfort Ave.
Brook St.	Avery Ave.	Southern R. R.
Private Property	Brook St.	Floyd St.
Floyd St.	Southern R. R.	A point near the City Limits.
Central Ave.	Fourth St.	L. & N. R. R.
Twenty-eighth St.	Walnut St.	Alley north of Jefferson St.
Thirty-fourth St.	Cedar St.	Hanover St.
Herman St.	Thirty-fourth St.	Westerly 200 ft.
Alta Ave. Sewer in Cherokee Park, Sherwood Ave. and Private Property	Middle Fork Sewer near Meadow Road	Alta Ave.
Cherokee Park	Alta Ave., Sewer	Cherokee Road.
Barney Ave.	Cherokee Road	Alta Ave.
Alta Ave.	Barney Ave	Everett Ave.
Everett Ave.	Alta Ave	Bonnycastle Ave.
Thirty-second St.	Woodland Ave	Virginia Ave.
O St.	Seventh St.	Sixth St.

STORM WATER INLETS.—That the sewers built by the Commission might become at once effective in providing for the disposal of storm water and thus fully useful at as early a date as possible, the Commission has built 225 storm water inlets, of which 7 have been in the form of catch-basins. Careful consideration was given to the desirability of building inlets rather than catch-basins as had been the city's custom for many years. It was felt, however, that in this climate it was unwise to provide pools of water in which mosquitoes could breed, as is the case where catch-basins are built, and further that under existing conditions the catch-basins for the retention of detritus were not necessary in most cases. It was also found that it was already the practice of the Board of Public Works to build inlets instead of catch-basins. The inlets built have been untrapped and the experience thus far indicates that this type of inlet has given satisfaction.

BEARGRASS CREEK IMPROVEMENT.—In the original report of the Board of Engineers, the sum of $35,000 was suggested as necessary for the general cleaning out of Beargrass Creek, to be used in filling holes and opening up the channel to prevent the formation of pools which are always insanitary. The Commission felt that some work of this kind might be necessary after the intercepter was put into use and the sewage diverted from the creek.

When the detailed studies by the Commission's engineering department were made, it was early found that the floods in Beargrass Creek, which have proved so disastrous to private property, had an important effect upon the capacity of some of the sewers tributary to the creek and had a marked influence upon the flooding which was more or less prevalent in the Dry Run and Broadway drainage basins. In view of these facts, the Commission requested the Engineers to make a comprehensive study of and report upon the improvement of Beargrass Creek, with particular reference to decreasing the height of water in the creek channel during freshets so as to render the sewers discharging into the channel as efficient as possible. This report was published in connection



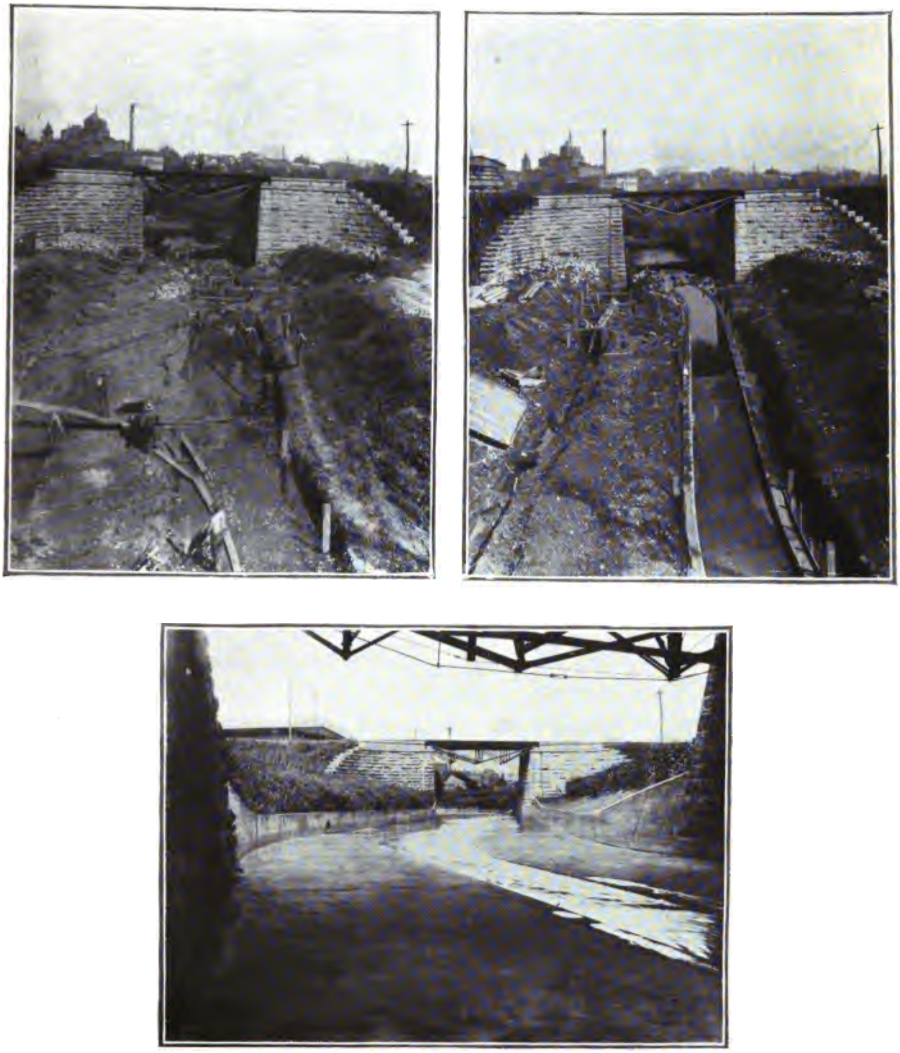
Improved Channel of Beargrass Creek, at junction of South and Middle Forks.

with the report of the Commission of 1910 and a plan was presented for the improvement of the main channel of Beargrass Creek from the Ohio River to the junction of the Middle and South Forks and of the channel of the South Fork as far south as the L. & N. Railroad bridge over the creek near Kentucky street. The estimated expense of this improvement was $904,800, a much greater sum than the Commission had at its disposal after carrying out the comprehensive plan of sewerage for the whole city published in the report of the Commission to the Mayor and General Council in October, 1906.

Less complete plans for the improvement of the creek, in harmony, however, with the plan already referred to, have been devised by the Engineering Department, and the Commission finally authorized the construction of the portion of this improvement extending from the Water Street Branch of the Louisville & Nashville Railroad on the north to a point about 400 feet south of the Baxter Avenue Bridge. The Commission felt that this work ought not to be undertaken until the other important projects were so far completed that it was evident that sufficient funds for the creek improvement would be available. For this reason, work upon this project was not authorized until late in 1911 and the last section—that portion of the channel south of Baxter Avenue—was not authorized until August, 1912, when all of the sewer work undertaken by the Commission had been finished. In this connection, it may be of interest to point out the fact that the total expenditure upon the improvement of Beargrass Creek has been $148,787.84, or less than the receipts from interest, so that more than the entire face value of the bond issue $4,000,000, was expended upon the construction of sewers.

The details connected with the construction of the Beargrass Creek Channel will be found in Part Two of this report. A masonry channel has been provided throughout that portion of the creek which has been improved, the side walls being built sufficiently high to retain the earth embankments on either side, and a concrete floor having been provided to prevent erosion and to furnish a smooth surface with uniform grade over which the water will flow. In the center of the floor of the channel is a small depression or channel provided to concentrate the dry weather flow sufficiently so that it may be self-cleaning. The bottom of the improved channel is from two to six feet lower than the bed of the creek before the improvement began. When the new channel is extended to the Louisville & Nashville Railroad Bridge near Kentucky Street, a free outlet will be provided for the Broadway and Dry Run Sewers and for the proposed Overflow Drain from the Southern Outfall at the intersection of Avery Avenue and Brook Street even in times of severe freshets. At times of extreme flood in the Ohio River, these sewers will continue to be submerged by back water as in the past. There seems to be no practicable remedy for this latter condition. The improvement of Beargrass Creek was begun at a point a short distance north of Main Street because a free outlet could be obtained only by going as far north as this point. If the work had been begun further south, the bottom of the lower end of the improved channel would have been several feet below the bed of the creek, so that there would have been no possibility of the channel being kept clean by the natural flow of water.

A short section of the channel below Baxter Avenue was built in connection with the construction of the Beargrass Intercepter and was charged to that account as the work was made necessary in order to change the location of the creek channel and thus provide a desirable location for the Intercepter. This work was fully described in the report of 1910. Until this improvement of the bed and the removal of buildings and trestles across the creek is carried as far south as the mouth of the Dry Run Sewer, lateral sewers embraced in the Dry Run system can not properly perform their work and flooding in the residential areas of the city drained by this system must from time to time continue.



Progressive views of work upon the Improved Channel of Beargrass Creek, North of Main Street.

Effect of the Work of the Commission.

SEWERAGE AND DRAINAGE AFFORDED UNSEWERED TERRITORY.—The trunk sewers built by the Commission have afforded a means of sewerage and drainage to very large areas of the city not previously sewered. The largest project—the building of the Southern Outfall—resulted in extending sewerage facilities to South Louisville, a community now well built up, and to the South Brook Street district, already containing a considerable population and several manufacturing plants as well as a very large area not yet built up. This trunk sewer also furnishes sewerage for that portion of Parkland through which it extends and the large district lying between Parkland and South Louisville. The funds available have not made it possible to build a large number of lateral sewers in these districts although a few of those most urgently needed have been built by the Commission and others by the Board of Public Works.

The building of this outfall and its branches has made it possible to drain the ponds of stagnant water lying on either side of Central Avenue east of Third Street, the pond known as the Thompson Pond, north of L Street and near its intersection with the Taylor Boulevard and the pond near the Southern Railroad where it crosses Brook Street. More or less water which stood in the upper Dry Run valley near the Louisville & Nashville Railroad shops after heavy rains and especially in the spring, has been drained into the Brook Street Sewer.

Upper Paddy Run has been a foul, sluggish stream, receiving sewage and wastes from industrial establishments, such as distilleries, tanneries and slaughter-houses. This stream ran through Shawnee Park and was a source of foul and offensive odors in the park and other portions of the district through which it ran. This Run has been taken into the Northwestern sewer which has also provided drainage for the large pond of stagnant water lying between Cedar and Jefferson Streets and Twenty-eighth and the Kentucky and Indiana Terminal Railroad. This pond covered an area equivalent to at least three city blocks.

In Happy Hollow there was a shallow body of water located northeast of High Avenue between Twenty-sixth Street on the west and Twenty-first Street on the east. It received the sewage from the Twenty-first Street Sewer and was foul and offensive. This pond has been largely drained into the Happy Hollow Sewer and reduced to a very small area. The sewage formerly discharged into it has also been diverted from it and now flows through the sewer system into the Ohio River at Thirty-fourth Street.

The old bed of Beargrass Creek from the Cut-off Embankment on the east to Campbell Street on the west was formerly filled in dry weather with stagnant and very foul water. The construction of the drain parallel to and near the old bed has afforded drainage for this locality and the ponds of stagnant water have disappeared. This drain is at such an elevation that the ponds lying northerly of the old bed may be drained into it at comparatively small expense at such time as conditions demand.

The Northeastern System of sewers and drains and the Middle Fork system of sewers have afforded sewerage and dainage for the large area in the northeastern part of the city which, up to this time, was practically without sewerage facilities except those provided by the Enterprise Sewer, formerly discharging at all times into the Middle Fork. The dry weather flow from this sewer has now been intercepted and discharges into the Middle Fork Sewer. Parts of the districts served by these sewers are now well built up and there is a decided tendency toward increased building activity in this part of the city which has been and undoubtedly in the future, will be encouraged by the sewerage facilities now afforded.

The Castlewood Sewer, extending from the Beargrass Intercepter to the intersection of Duker Avenue and Schwartz Avenue, furnishes sewerage and drainage to a large and rapidly growing district. This sewer is designed to receive both sewage and surface water, the dry weather flow being taken into the intercepter and the storm flow discharging into Beargrass Creek.

The construction of the sewer in Oak Street between Seventh Street and Fourteenth Street enabled the city to complete and use the underpass at the crossings of the Louisville & Nashville Railroad and the Illinois Central Railroad and provide for the construction and operation of the Oak Street crosstown line. The construction of the sewer in Hill Street from the Southern Outfall to the first alley west of Sixth Street provided drainage at such a depth that the underpass at the Louisville & Nashville Railroad crossing could be lowered, and the street railroad system extended to the territory adjacent to the Avery Plow Works.

DIVERSION OF SEWAGE FROM BEARGRASS CREEK.—The South Fork of Beargrass Creek formerly received very large quantities of sewage from the central portion of the city as well as from the suburban districts lying east of the Creek and the Dry Run valley. The flow of the creek except in time of storm, is so small that this quantity of sewage, considerably greater in amount than the normal flow of the creek, caused it to become foul and offensive. Nearly all of the sewage from the city sewers formerly discharging into this creek has been intercepted and now finds its way to the Ohio River through the Beargrass Intercepter. Since the completion of this work the character of the creek water has greatly improved although it is still considerably polluted by industrial wastes discharged directly into it from the various establishments located along its banks, such as distilleries and slaughter-houses. In times of storm the combined flow of sewage and storm water will be received by the intercepter until its capacity is reached, after which the surplus flow will pass into the creek. These overflows will take place only in times of storm and will not prove objectionable.

RELIEF FROM FLOODING.—Many of the sewers of the city which were of adequate capacity at the time they they were built to serve the needs of the territory draining into them have gradually become unable to promptly carry away the run-off in time of storm because of the increasing impervious area of roofs, walks and paved streets. This condition resulted in flooding due to the failure of the sewers to carry away the storm water in many parts of the city. The sewers built by the Commission have added greatly to the capacity of the sewerage system for carrying away storm water and have practically eliminated damages arising from flooding.

THE EFFECT OF IMPROVED SEWERAGE FACILITIES UPON THE HEALTH OF THE COMMUNITY.—While it is universally conceded that improved sewerage facilities are followed by the improved health of the community, it is difficult to point out specific reasons for and proofs of such improvement.

The prevalance of typhoid fever has come to be considered a more or less reliable index of the sanitary condition of a city, insofar as its health is related to its drainage system and its water and food supplies. This is not because it is the only disease influencing the public health through these channels but because of all such diseases, such as cholera, dysentery and other diarrheal diseases, typhoid fever has been sufficiently prevalent and dangerous to demand a thorough study of conditions causing it and the collection of vital statistics pertaining to it. It has, therefore, come to be one of the best known diseases, and much data regarding it have been accumulated and are available for study.

Typhoid fever may be contracted in a number of different ways, the most important of which are by the drinking of contaminated water and milk, the eating of uncooked contaminated food, such as shell-fish, fruits and vegetables, direct contact with persons suffering from the disease, and by contamination transferred from infected matter to food supplies by flies. A Commission appointed to investigate the cause of typhoid fever in the camps of the soldiers during the Spanish War concluded that the disease was due principally to flies which "swarmed over the infected fecal matter in the pits and then visited and fed upon the food prepared for the soldiers." It has been shown by a number of investigators that the prevalence of typhoid and other intestinal diseases is coincident with the prevalence of flies and that the greatest number of deaths from such diseases occurs in localities where the flies have access to infected matter. In his sanitary survey of Louisville, made at the instance of the Commercial Club in 1893, Mr. Rudolf Hering reported that a noticeably large proportion of typhoid fever cases in Louisville were found in the vicinity of Beargrass Creek, and apparently considered it to be due to the air in that locality, vitiated by the filth discharged into the Creek from the sewers.

Louisville, like many other cities in the central and southern part of the country, has had a very high typhoid fever death rate in past years. On the average there were ninety deaths from this disease per hundred thousand population from 1881 to 1889, inclusive, and from 1898 to 1908, the United States Census Bureau records show an average of 57.4 deaths per 100,000.

It is a well-known fact, supported by abundant satisfactory evidence, that the filtration of a contaminated public water supply has resulted in a considerable diminution in the prevalence of typhoid fever in many cities which have provided such filtered supplies. While there is little evidence of the extent to which the unfiltered Ohio River water was used for drinking purposes prior to its filtration, there appears to be no doubt that it was so used to a considerable extent.

The filtration of the city water, which was begun about the middle of August, 1909, has been followed by a marked decrease in the death rate due to typhoid fever, and it seems highly probable that a considerable portion of this reduction is due to the improved quality of the municipal water supply resulting from the successful operation of the water filters. It must be admitted, however, that any reduction prior to September, 1, 1909, was due to other causes.

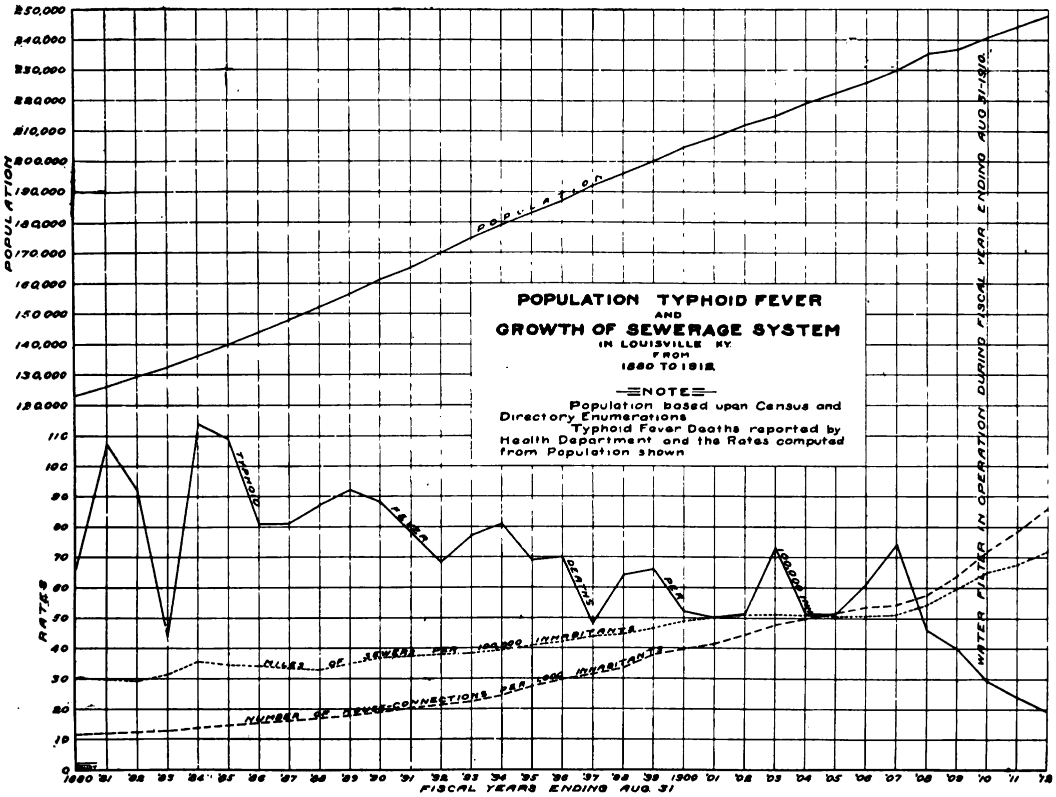
A study has been made of the typhoid fever death rate of Louisville as compared with the growth of the sewer system, Diagram B shows the population, the typhoid fever rate per 100,000 population, the number of miles of sewers, and the number of house-connections for each year from 1880 to 1912 inclusive. This same data is shown in Table 8.

TABLE NO. 8.

TABLE OF POPULATION, MILEAGE OF SEWERS, NUMBER OF HOUSE CONNECTIONS AND TYPHOID FEVER RATE, 1880 TO 1912 INCLUSIVE.

Year	Population	Total Mileage of Sewers per 100,000 Population	Total Number of House Connections per 1,000 Population	Deaths from Typhoid Fever per 100,000 Population
1880	123,151	30.1	11.51	66
1881	126,000	29.8	12.03	107
1882	129,500	29.3	12.49	92
1883	132,500	31.5	12.81	44
1884	136,000	35.9	13.94	114
1885	140,000	34.9	14.90	109
1886	144,000	34.2	15.43	81
1887	148,000	33.4	16.10	81
1888	152,500	32.7	16.70	87
1889	156,500	35.0	17.85	92
1890	161,129	36.8	18.95	88
1891	165,000	37.4	20.23	78
1892	170,000	37.8	21.25	68
1893	174,500	38.3	22.40	77
1894	179,000	39.2	24.40	81
1895	183,000	40.9	27.40	69
1896	187,000	42.0	29.55	70
1897	192,000	43.8	31.10	48
1898	196,000	44.5	33.20	64
1899	200,000	46.6	37.62	66
1900	204,731	48.7	39.70	52
1901	208,000	50.0	41.40	50
1902	212,000	50.6	44.20	51
1903	215,000	51.0	47.60	73
1904	219,000	50.9	49.60	51
1905	222,500	50.5	51.40	51
1906	226,000	50.5	53.50	61
1907	230,000	51.0	54.35	74
1908	235,500	54.1	57.45	46
1909	237,000	59.4	63.50	40
1910	241,000	64.9	71.70	29
1911	244,500	67.5	78.30	24
1912	247,758	71.7	86.00	19

It is interesting to note that there has been a gradual decrease in the death rate from typhoid fever with the gradual increase in the number of house-connections per 100,000 population; for example—from 1881 to 1889, there were but fifteen house-connections per 1,000 persons living in Louis-



POPULATION TYPHOID FEVER
AND
GROWTH OF SEWERAGE SYSTEM
IN LOUISVILLE KY.
FROM
1880 TO 1912

═NOTE═

Population based upon Census and Directory Enumerations

Typhoid Fever Deaths reported by Health Department and the Rates computed from Population shown

DIAGRAM B.

ville, and the death rate was 90 per 100,000, while in 1908, there were 57 house-connections per 1,000 persons and the death rate had been reduced to 46 per 100,000, and in 1909, when there were 64 house-connections per 1,000 persons, the death rate from typhoid fever was but 40 per 100,000. While the water filters were put into operation in August, 1909, they could not have had any effect upon the rapidly decreasing death rate before that time as the statistical year closed August 31. The lowest death rate in recent years was in 1912, the rate being 19 per 100,000, at which time there were 86 house-connections per 100,000 persons living in the city. A considerable part of this continued decrease in the typhoid death rate is undoubtedly due to the improved water supply, although it is true that the relation existing between the number of house-connections and the typhoid fever death rate during the years previous to the filtration of the municipal water supply has continued.

Further light may be thrown upon the cause of typhoid by an examination of the data contained in the report of the Health Department upon the investigation of typhoid fever causes for the year ending August 31, 1911. During this year there were 138 cases which may be subdivided, as shown in the following table:

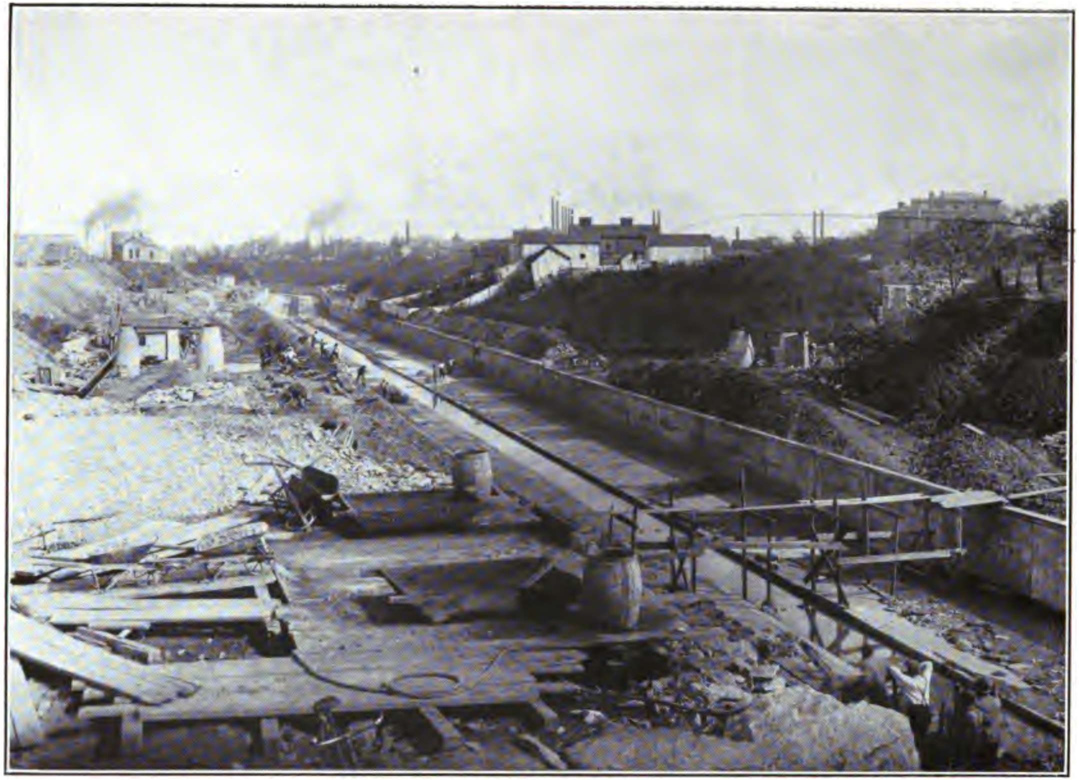
TYPHOID FEVER CASES FOR YEAR ENDING AUGUST 31, 1911.

Cases contracted outside city	5	3.6%
Cases drinking well, spring or cistern water	24	17.4%
Cases drinking filtered river water	109	79.0%
Total	138	100.0%
Cases using open privy vaults	101	73.0%

There were five cases reported to have been undoubtedly contracted outside the city. Of the remainder, only 24, or 17.4 per cent., of the typhoid cases were found to have used well, spring or cistern water, while 109, or 79 per cent., were supplied with the filtered river water. It thus appears that only a moderate proportion of the cases could be attributed to the use of well water. One hundred and one, or 73 per cent. of the typhoid cases were found in families using open privy vaults, and while it is not possible to prove that any of these cases were contracted through the agency of flies and these vaults, nevertheless, the large number of cases occurring in localities where open vaults are in common use is very significant, and leads to the conclusion that the improved sewerage facilities have been an important factor in the gradual reduction of the typhoid fever death rate during the last thirty years. The work which the city has done under the direction of the Commissioners of Sewerage constitutes an important step toward furnishing adequate sewerage facilities which will have a highly beneficial effect upon the health of the community.

IMPROVEMENT OF BEARGRASS CREEK CHANNEL.—The result of the work done upon the Improvement of Beargrass Creek will be a reduction in the height of water flowing in the creek during freshets. This result will be much less than if it had been possible to complete the work. It is believed, however, that there will be a sufficient reduction in the height of water under flood conditions to materially increase the capacity of the Broadway Sewer. The effect, at Broadway, of the improved channel of the creek thus far constructed was shown by the much lower maximum elevation of the water during the extraordinary freshet of March 25, 1913, as compared with the freshet of February, 1909. During the earlier freshet the water passed over the surface of the street to a depth of eighteen inches. In the later storm, although the rainfall was heavier, the water during the freshet was not higher than a point four feet below the street elevation.

The dry weather flow channel in the center of the floor of the masonry channel, if kept clean, will provide for the rapid flow of the water of the creek, and the paved floor of the channel will prevent the formation of stagnant pools, which have been so common in the past, and will also make easy the process of cleaning. The sanitary condition of the portion of the creek which has thus been improved should be entirely satisfactory if reasonable care is given to its maintenance.



Improved Channel of Beargrass Creek. Looking Northeast over Section "B" and "C."

Adequacy of Present Sewer System.

As the city continues to grow and the proportion of the area covered by impervious pavements and roofs is increased, the rapidity with which the rainfall reaches the sewers is also greatly increased. This change follows the increase in density of population, resulting in a larger number of buildings in a given area, the change of the character of the districts from residential to mercantile and manufacturing areas, and the improvement of street construction by which smooth pavements are substituted for rough and uneven pavements. As these changes take place in the future, demands upon the present sewers will be greatly increased and in some cases it is probable that they will ultimately become overtaxed. This tendency will be first noticed at times of storms and extreme and unusual intensity but such occasions will become gradually more numerous until some of the sewers may be found to become overtaxed even in storms of moderately high intensity, when it will be found necessary to provide further relief sewers.

The Southern Outfall Sewer, although the largest in the city, is now serving a territory which, taken as a whole, is but partly settled and is almost wholly of a residential character. As this drainage area becomes more thickly built up and the character of certain districts is changed by the growth of manufacturing and mercantile establishments, the yield of storm water will be much more rapid than at present. Ultimately it will be necessary to furnish relief to this sewer by means of other sewers which will convey a portion of the run-off from this area directly to Beargrass Creek or the Ohio River.

The foregoing statements apply with equal force to all of the main arteries of the city's sewer system as well as to a large proportion of the larger and older lateral sewers.

There are within the city about 315 miles of dedicated streets, paved and unpaved, of which 175 miles, approximately, have no sewers, but as the sewers in adjacent alleys fill the need in many cases, it may be said that there are about 150 miles of sunsewered streets within the city, of which at least 100 miles are badly in need of sewers at the present time. It is interesting in this connection to note the fact that there are 315 miles of water pipes in use exclusive of the large supply mains, that is, the mileage of service water mains is approximately equal to the number of miles of streets and is nearly double the number of miles of sewers. The number of house-connections in 1912 was 86 per thousand inhabitants. Assuming that each connection serves on the average five persons, it appears that about four hundred and thirty persons out of each thousand, or forty-three per cent. of the population, are provided with sewerage facilities. These figures while very general indicate clearly the great need of increased lateral sewerage facilities.

Recommendations for New Work.

As has been pointed out in several places, the Southern Outfall system has been designed upon the assumption that an Overflow Drain will be built in the near future from the intersection of Avery Avenue and Brook Street to Beargrass Creek at a point a short distance north of Kentucky Street. Before this sewer is built, the channel of the South Fork of Beargrass Creek must be improved in accordance with the plan proposed in the Special Report of the Engineers to the Commissioners of Sewerage and published with the report of the Commissioners of Sewerage in 1910. This improvement of the Creek is also much needed to give to the Broadway and Dry Run sewers their nominal capacities.

There has been a tendency in the last few years to increase the depth of basements in business buildings. In the heart of the retail district, the present sewers are comparatively shallow and can not afford satisfactory drainage for the moderately deep basements. It is of course, impracticable to provide drainage for the excessively deep basements which have been built in some cases.

The Fifth Street Sewer south of Green Street is taxed to its full capacity in times of excessive precipitation. The lower end of the Fifth Street Sewer north of Green Street appears to have at the present time a surplus capacity. It is, therefore, recommended that a new sewer be built from and connected with the Fifth Street Sewer at Green Street, westerly in Green Street to Center Street, and thence southerly to Chestnut Street. The sewers in Walnut and Chestnut Streets west of Fifth Street should be connected with the new sewer in Center Street and provision made for the overflow of the sewage from the sewers in Walnut and Chestnut Streets east of Center Street into the new sewer. There is a connection from the present sewer in Chestnut Street to the sewer in Fifth Street running north to the Ohio River, and another connection to the sewer in Fifth Street running south to York Street and thence to the Southern Outfall. When the sewer in Center Street is built, the connection from Chestnut Street west of Fifth Street to the Fifth Street Sewer running south should be discontinued.

The sewer built in Thirty-second Street by the Commission, with the co-operation of the city, from the Southern Outfall to Virginia Avenue should be extended northerly to Bismarck Avenue; thence easterly in Bismarck Avenue to Twenty-eighth Street, making it possible to build Bismarck Avenue between Thirty-second and Twenty-eighth Streets. It should then be extended northerly one block to Grand Avenue, where the present sewer in Twenty-eighth Street can be intercepted, the drainage now passing through it into Western Outfall from the district lying north and south of Grand Avenue and as far easterly as Eighteenth Street being turned into the proposed new sewer and thence into the Southern Outfall. This should relieve the Twenty-eighth Street Sewer so that there will be no further trouble from flooding at Twenty-eighth Street and Greenwood Avenue.

A large branch should be built connecting with the Southern Outfall in Thirty-fourth Street northerly to a point in the vicinity of Garland Avenue and thence easterly to connect with the present Western Outfall. This will provide sewerage for the unsewered territory along Thirty-fourth Street and easterly in the vicinity of Garland Avenue, and will also make it possible to furnish relief to the Western Outfall Sewer in the vicinity of Maple Street.

A branch sewer should be extended from the Southern Outfall southerly in Twenty-third Street to drain the territory between Eighteenth Street and the Cane Run Road.

In preparing the original report, the Board of Engineers recognized the necessity of constructing a sewer from the Northwestern Sewer through the valley of the most northerly branch of Upper Paddy Run. This sewer should have a branch running northerly in Bannon's Lane to reach the southern portion of Portland, and another branch running easterly to Youngstown, now well built up and steadily growing. These sewers were not included in the original plan adopted by the Commission for the reason that the territory to be drained was then outside the city limits. Since that time, however, the city limits have been extended, and these sewers are now needed.

A small intercepting sewer should be built along the main stem of Beargrass Creek from the present Northeastern Sanitary Sewer to a point a short distance above Spring Street to receive the dry weather flow of combined sewers already built in this district as well as the slaughter-house and other manufacturing wastes now discharging into the creek. A sanitary sewer carrying the dry weather flow should be built from the Baxter Avenue Sewer near the bridge over Beargrass Creek to the sewer in the second alley southwest of Baxter Avenue, thus providing for the conveyance of the sewage of this district to the Beargrass Intercepter through the Phoenix Hill siphon. A right of way has been obtained for this sewer adjacent to the east wall of the creek channel, and it should be built as soon as this improvement in this vicinity has been completed.

The city limits have recently been extended from Duker Avenue southeasterly along Bardstown Road, bringing within the present city limits a portion of Bardstown Road and the territory north of it, which are now in need of sewerage facilities. This is a rapidly growing district and the Middle Fork Sewer system should be extended into it at an early date.

A similar condition exists in the upper Castlewood district on the southerly side of the Bardstown Road, and the Castlewood Sewer system should soon be extended to furnish sewerage facilities for this district.

A sanitary sewer has been constructed in Long Avenue to Stilz Avenue, thus furnishing an outlet for the sewage from the south side of Crescent Hill. Lateral sewers should be built to serve this territory which is now well built up and growing.

Further relief sewers to supplement existing sewers in various parts of the city and prevent flooding should be built from time to time as the proportion of impervious area is increased and the storm water reaches the sewer system more rapidly than in the past.

The old Preston Street Sewer drains a territory, some of which is below the level of the river at its high stages, so that it was necessary to construct a gate in the sewer, by which the river water might be shut out from this low land. The closing of this gate, of course, is followed by the storage of the sewage within the sewer or upon the low land for such time as the river remains at a high stage. During the high water in the river in 1912, the sewage in this sewer district flowed out upon low land in the vicinity of Shelby Street, between Fulton Street and the Louisville & Nashville Railroad, causing an exceedingly offensive condition, the sewage standing above the foundations of several houses, some of which were occupied. A similar condition existed on the Point, between the Cut-off Road and Campbell Street. The sanitary protection of this portion of the city demands that this condition be corrected, one method for doing which would be the installation of pumping stations near the outlet of the Preston Street Sewer, at Fulton Street, and the outlet of the Northeastern Drain near the Cut-off Road.

The improvement of Beargrass Creek, in accordance with the plan outlined in the report of the Engineers to the Commission, published in 1910, has been fully discussed in the present report. This work will be completed by the Commission from a point a short distance north of Main Street to a point south of Baxter Avenue. This same character of improvement should be, if possible, continued southward to the mouth of the Dry Run Sewer at Caldwell Street, thus increasing greatly the efficiency of the Broadway and Dry Run systems. This work is of the utmost necessity as the successful operation of the sewer systems draining the Broadway and Dry Run districts is dependent upon it. The territory now served by these two trunk sewers extends approximately from Walnut Street on the north to Avery Avenue on the south and from Beargrass Creek on the east to Third Street on the west. The trouble within these districts has been partly due to insufficient sewers but the principal and controlling difficulty is flood-water in Beargrass Creek, caused by storms of even moderate intensity, and not until the creek is improved from Baxter Avenue to the outlet of the Dry Run Sewer will this trouble cease. The construction of the overflow drain from the Brook Street Sewer at Avery Avenue, before mentioned, is dependent upon the improvement of the creek as far south as the angle near Kentucky Street.

These recommendations for future sewer construction are made without references to plans being made or work now being done under the direction of the Board of Public Works from the funds derived from the sale of the city's stock in the Louisville Gas Co.

SOURCES AVAILABLE FOR FUNDS FOR FUTURE SEWER CONSTRUCTION.—The city has raised by taxation from year to year relatively small amounts for the purpose of building new sewers. In recent years these varied in a general way from $10,000 to $150,000. These amounts are entirely inadequate to provide new sewers necessary to keep pace with the natural growth of the city, and yet these funds have been encroached upon from time to time for sewer repairs and maintenance. Larger amounts should be raised each year for the purpose of building new sewers so that the sewer system may at least keep pace with the natural growth of the city.

The city is fortunate in having sold its stock in the

Louisville Gas Co. at an advantageous price, and in having had the authority to use the proceeds of this sale for the construction of new sewers. The sum thus made available will help to enlarge the sewer system to meet the urgent needs now felt in so many portions of the city, but it will not alone be sufficient to cope with the requirements. It should not be made an excuse for failing to include in the tax levy in the future amounts fully as large as those raised in the past for the purpose of building new sewers.

The Legislature of 1912 passed an Act, authorizing the submission to popular vote of an ordinance providing for the issue of bonds in the amount of $2,000,000 for the construction of sewers. This authority will be available at any time when it seems expedient to provide these additional funds. That such an amount is needed even at the present time, in addition to all other funds available for sewer construction, can not be doubted.

Disposal of Sewage.

At the present time the sewage of the city is discharged directly into the Ohio River through seventeen outlets. These outlets are practically all submerged at ordinary stages of the river. Above the dam they are submerged at pool stage, and below the dam they will be submerged at pool stage when the next dam below is constructed.

The original report of the Board of Engineers included a plan by which the sewage flowing in these trunk sewers can be intercepted and conveyed around the city to the Southern Outfall when necessary. The general route of the Ohio River intercepter by which this can be done was described in the report and is shown on the map accompanying the report of the Commission published in 1910.

In commenting upon the possible necessity of building this intercepter at some future time and treating the sewage before its discharge into the river, the Board of Engineers made the following statement

"By means of this intercepter, all of the sewage of the city will eventually be brought to one point, namely, the junction of the intercepter with the Southern Outfall. If at such time or subsequently, on account of Federal or State Government or other action, there should arise conditions requiring the partial or substantially complete purification of the sewage before its discharge into the Ohio River, one very important step in the solution of the problem of disposal would have been accomplished. From the Southern Outfall the sewage can be readily pumped to such site as may be chosen for the purification plant."

All extensions of and additions to the sewer system made by the Commission have been so planned that if it ever becomes necessary to treat the sewage, it can be readily intercepted and conveyed to a common point from which it can be pumped to the treatment plant.

FEATURES OF PRESENT SEWER SYSTEM AND CARE WHICH IT SHOULD RECEIVE.—By far the larger part of the city is provided with combined sewers which are to receive both sewage and storm water. The northeastern portion of the city is provided with separate sewers and storm drains. This method of sewerage requires the construction of two pipes in each street, one which should receive sewage only, the storm water being strictly excluded. The other should receive the storm water and sewage should be excluded. The success of the separate system depends upon the strict enforcement of the separation of storm water from sewage. There have been, since these sewers were built, a number of instances where house sewers were improperly connected with the storm drains and where pipes carrying storm water were improperly connected with the sewers. The sewers are not of sufficient size to carry any considerable amount of storm water and if storm water is discharged into them in material amounts, they will be surcharged in time of storm and the combined sewage and storm water will be forced back into the houses and may overflow upon the surface of the streets. A relatively small number of such connections might render the separate system a source of considerable damage and every care should be taken to prevent such connections. The storm drains, while large enough to accommodate both storm water and sewage, discharge into streams which ought not to be defiled with sewage. Some of these drains discharge into the Middle Fork within the limits of Cherokee Park and others discharge into the Edwards Pond Branch, a small stream flowing along Letterle Avenue. The discharge of sewage into such streams will result in highly offensive conditions and should be prevented by the exercise of care to prevent the improper connection of pipes carrying sewage with the storm water drains. The record drawings turned over to the city clearly indicate the character of the sewers and drains so that the official issuing permits for connections with the sewers and drains can readily ascertain and designate to the drain layer the pipe with which the house sewers should be connected and the pipe with which storm drains should be connected. The purpose of the sewers built by the Commission is shown in Appendix C.

It has been necessary to build some of the sewers crossing Beargrass Creek or other streams, in the form of inverted siphons. In all, nine such siphons or similar structures have been built. In some cases, the siphons consist of a battery of two or more pipes so that the flow can be turned through the smaller of the pipes during the earlier years when the flow is small, thus providing a self-cleaning velocity in the siphons. It is advisable, however, that these siphons and similar structures be watched constantly to ascertain their condition and they should be cleaned as often as necessary to keep them in good working order.

The combined sewers discharging into the Beargrass Intercepter and its branches and the Western Outfall discharging into the Western Intercepter are provided with automatic gates or regulators, by which the flow into the intercepters is regulated and controlled in times of storm. The pipes leading from the trunk sewers to the intercepters are relatively small and frequently timbers, cans, masses of wire and other trash are found in the regulators and if not promptly removed, clog the gates and orifices. These regulators have been inspected daily and cared for during the last two years, by a man employed by the Commission for this purpose. This patrol should be continued. In Table 9 will be found a list of the siphons, requiring frequent or daily inspection. The patrol should inspect and care for all of these structures although at times of trouble it may be necessary to give him some assistance in cleaning.

TABLE NO. 9.

INVERTED SIPHONS IN THE SEWERS BUILT BY THE COMMISSIONERS OF SEWERAGE.

Sec. A, Middle Fork Sewer	At crossing of South Fork of Beargrass Creek near L. & N. R. R.
Sec. B, Middle Fork Sewer	At crossing of Middle Fork of Beargrass Creek near Quarry and Spring Sts.
Sec. D, Middle Fork Sewer	At crossing of Middle Fork of Beargrass Creek east of Raymond Ave.
Sec. A, Northeastern Sanitary Sewer	At crossing of Beargrass Creek between Letterle and Mellwood Aves.
Sec. B, Northeastern Sanitary Sewer	Schoeffel Ave.
Sec. C, Northeastern Sanitary Sewer	Letterle Ave. west of Vernon Ave.
Enterprise Sewer Connection	At crossing of Middle Fork of Beargrass Creek near outlet of Enterprise Sewer.
Cooper St. Sewer Connection	At crossing of South Fork of Beargrass Creek on line of Cooper St., if extended.
Phoenix Hill Sewer Connection	At crossing of South Fork of Beargrass Creek about 450 ft. southwest of Baxter Ave.
Brent St. Sewer Connection	At crossing of South Fork of Beargrass Creek near line of first alley north of Broadway.
Sec. A, Castlewood Sewer	At crossing of South Fork of Beargrass Creek near City Limits.

The drain built along the old bed of Beargrass Creek from the Cut-off westerly was of necessity laid on a flat grade because of the low elevation of the area to be drained by it with reference to the height of water in the Ohio River at pool stage. Even at the elevation at which the drain is built, water will stand at such a height in the Ohio River and Beargrass Creek that it will back up into the lower end of this drain to a depth of one foot at the lower end at pool stage. During the past year, material from a fresh fill, made on account of railroad construction, was washed into this drain and some of it was deposited in it. This has been removed and the drain thoroughly cleaned by the Commission. This structure should be examined from time to time to ascertain its condition, and if deposits accumulate in it they should be promptly removed.

With the exception of the Southern Outfall where built at a great depth, branches for future house connections have been built into the structures so that when such connections are made it will not be necessary to cut into the sewers with liability of injury to the sewer barrel. These branches have been located and are shown upon the record drawings turned over to the city with sufficient reference ties so that it will be possible for the drain layers to find them without difficulty. A number of instances have come to the attention of the engineers of failure to utilize these branches during the past few years and the sewers have been unnecessarily cut into on this account. It is important for the preservation of the structures that the branches be used in every case where possible.

Branches were not placed in the Southern Outfall between the Ohio River and Fifth Street, throughout which distance the sewer is 25 or more feet in depth, it being the intention to serve the abutting property by means of lateral sewers in the intersecting streets or wherever necessary by high level sewers parallel to the Southern Outfall.

As pointed out elsewhere most of the sewer outlets into the Ohio River are now submerged at pool stage above the Falls and will be submerged at pool stage below the Falls when the next dam below is constructed. As the sewers are on a steep grade within a short distance of the river, it is believed that the velocity of the flow will be sufficient to keep them scoured out and clean.

Most of the inlets to the sewers built by the Commission have been direct and are not trapped and do not provide for the retention of solid matter. A few catch-basins have been built in localities where it was found that gravel or coarse materials might be carried into the sewers in times of storm and cause deposits in them. In past years the city has built many catch-basins, the present number being about 2,500. These should be cleansed at frequent intervals that the material retained in them may not give off offensive odors and that they may serve the purpose for which they were built, that of retaining solid matters carried into them in times of storm. These basins contain stagnant water and no doubt afford breeding places for mosquitoes. It may be wise to oil the water standing in the basins to prevent the breeding of mosquitoes as is now being done in Washington, D. C.

The recent practice of the city and that of the Commission has been to provide direct inlets from the street gutters to the sewers. These inlets are untrapped and at times, in certain localities, slightly objectionable odors may be noticed coming from them. Similar odors may occasionally be noticed coming from perforated manhole covers. While these odors may be somewhat objectionable, so far as is now known they are entirely harmless. Numerous investigations have been made to ascertain if the air coming from sewers contain harmful bacteria but in these investigations, the result has generally been negative.

It is desirable that a sewer system be well and thoroughly ventilated. The best means of accomplishing this is to provide free outlets for the sewer air through the house drains and vent pipes to the roofs. Formerly, traps were required to be installed upon such drains but in recent years, this has not been the practice in Louisville. In many cities in this country main house traps are not permitted and thus free ventilation of the sewers is possible. At the present time it is probable that a large proportion of the house connections in Louisville are provided with traps but as new buildings are erected, the proportion of untrapped pipes will increase and the sewer system will become better ventilated. With the increase of free ventilation, the trouble from street inlets and perforated manhole covers should decrease.

The Beargrass Creek channel, as improved by the Commission is provided with a smooth, hard bottom which can easily be cleaned. There will no doubt be some accumulation of sand and gravel in this channel, especially during the next few years and until the masonry channel is extended as far south as Kentucky Street. This channel should be cleaned at least once each year, preferably during the early summer, so that the channel may be in good condition for the dry weather flow in the summer and early fall. For many years it has been a common practice to dump earth and refuse along and over the banks of this creek. This practice should be strictly prohibited by ordinance and the ordinance should be rigidly enforced.

Rights of Way.

Where there were no dedicated streets in the locations finally selected for sewers or other structures, the Commission made earnest efforts to obtain rights of way from the owners of the lands free of expense. In the greater number of cases the Commission was successful in obtaining gratis the rights of way required. At some locations, however, it became necessary to purchase the land outright and in a few instances, it being found impossible to reach an agreement with the owners of the property, suits for condemnation were filed and carried to a conclusion. A list of the rights of way acquired since the report of 1910 will be found in Appendix D.

In one or two instances it was necessary to purchase a greater area of land than was required for the location of the structure, therefore, the Commission has sold the portion of the land not needed when an advantageous sale could be made.

The following parcels of land remain in the possession of the Commission to which the city has a title in fee simple:

Remainder of land purchased from Kraft, Kaiser, Layer, Shackelford, Vissman and Straus being a parcel of land 10 ft. wider than the improved channel of Beargrass Creek and about 405 ft. long lying just north of Cooper Street, if extended, now occupied by the Improved Channel of Beargrass Creek.

Land purchased from Wm. Banks and R. L. Sanders being a lot 180 ft. deep and of an average width of 60 ft. on the westerly side of Amy Avenue or Thirty-sixth Street, the northerly line being the northerly line of Cedar Street, if extended. This lot is directly upon the line of Cedar Street and contains the Northwestern Sewer.

Land purchased from Wm. Krupp and wife beginning on the easterlyside of Schiller Avenue at a point of 455 ft. southeastwardly from the extension of the northwardly line of Dandridge Avenue, running thence southeastwardly along the eastwardly line of Schiller Avenue 30 feet and extending back northeastwardly of that width between lines at right angles to Schiller Avenue 400 ft. more or less, to Ellison's northeastern line. The connection from the Southeastern Outfall Sewer to the Beargrass Intercepter runs through this lot.

Land purchased from Henry Bickel and wife being a parcel of land 203 ft. southwest of Baxter Avenue, extending from the right of way of the Louisville & Nashville Railroad Co. to the former location of Beargrass Creek and being 166 ft. wide, now occupied by a portion of the Improved Channel of Beargrass Creek.

Land purchased from George Charles Jetter, et al., being the rear portion of a lot situated on the north side of the first alley north of Broadway 309 ft. west of Underhill Street, 40½ ft. wide and about 45 ft. deep. This tract was purchased for the purpose of improving the channel of Beargrass Creek a short distance north of Broadway but the improvement was not carried to this location.

Land purchased from Elizabeth M. Luken being a lot

50 ft. wide by 183 ft. 7 in. deep on the easterly side of Amy Avenue, the southerly line being near the southerly line of Cedar Street, if extended. This lot is directly upon the line of Cedar Street and contains the Northwestern Sewer.

Condemnation suits were instituted against the following owners of property and rights of way obtained through court judgments:

P. D. and R. J. Lorenz, Paul Loeser, Mrs. Leo Messmer and Daniel Weiss.

Testing Laboratory.

During 1908, a testing laboratory was equipped for the purpose of testing cement and other materials used in the construction of sewers. A photographic outfit was also installed for the purpose of taking photographs of the work in progress and the buildings in close proximity to sewers that were built, showing any defects prior to the beginning of construction work, and showing damages, if any, caused by the construction of the sewers. These photographs have proved of value in many ways. The total expense of the laboratory and the labor and supplies in connection therewith to March 31, 1913, has been $17,204.76. This expense may be sub-divided as follows:

Cement Testing (233,168 barrels)	$10,887 14
Other Tests and Investigations	3,653 26
Photography	2,664 36
Total	$17,204 76

From July, 1908, to March 31, 1913, a total of 233,168 barrels of cement has been sampled, tagged and tested in accordance with the practice described in detail in the report of 1910. The amount of cement tested during each year was as follows:

1908	51,775	barrels
1909	107,762	"
1910	51,275	"
1911	12,950	"
1912	8,680	"
1913 (3 months)	726	"

The cost of sampling, tagging and testing cement from July, 1908 to March 31, 1913, including the entire cost of that portion of the equipment of the laboratory used in connection with cement testing, has averaged $0.047 per barrel.

The average results of cement tests for the last three years are given in Table 10:

TABLE NO. 10.

CEMENT TESTED FROM DECEMBER 1, 1909, TO JANUARY 1, 1913.

Brands	Carloads Tested	Fineness		Tensile Strength (pounds)				
		Per cent passing through sieve		Neat			Mortor (1-3)	
		No. 100	No. 200	24 hrs.	7 days	28 days	7 days	28 days
December 1, 1909, to January 1, 1911.								
Alpha	6	96.3	83.0	311	642	730	338	462
Kosmos	219	94.6	80.6	306	634	795	269	413
Lehigh	118	94.6	79.6	353	686	781	287	410
Old Dominion	7	93.8	81.7	360	735	778	340	421
Speed	53	96.4	82.0	342	678	766	326	431
January 1, 1911, to January 1, 1912.								
Kosmos	36	94.5	82.4	312	669	802	308	427
Lehigh	34	93.1	81.3	319	711	803	338	427
January 1, 1912, to January 1, 1913.								
Speed	19	93.4	83.0	298	571	709	279	382
Lehigh	26	91.5	82.3	350	675	779	307	401
Kosmos	4	94.0	81.9	322	641	810	245	389

Before the establishing of the laboratory of the Commission, between July, 1907, and July, 1908, 2,856 barrels of cement were tested under agreements with local cement testers.

The total number of barrels of cement tested for the work of the Commission is, therefore, 236,024 barrels.

The numerous special investigations which have been made by the laboratory department have been of material assistance in the solution of special problems; among these may be mentioned mechanical analysis of sand and gravel, a chemical analysis of water and sewage, with special reference to determine the effect of industrial wastes upon masonry structures, tests of jointing materials, and of waterproofing compounds and brick, and abrasion tests made with reference to the selection of proper materials for sewer inverts.

The operation of the testing laboratory has been under the direction of Mr. H. B. Allen from July, 1908, to March 31, 1913.

Bookkeeping.

The bookkeeping branch of the Headquarters Department has continued the compilation of all data collected relating to the cost to the contractors of the actual work of construction and in addition has kept the accounts of the day-labor force.

Precipitation.

A recording tipping bucket rain-gauge was purchased in 1907 and has been located on the roof of the Equitable Building during the last five years. In Table 1, Appendix E, will be found the records of intensity of precipitation during storms in which the intensity for a period of fifteen minutes was as high as one inch per hour and the total precipitation one-half inch.

The monthly and average precipitation, as compiled by the United States Weather Bureau at Louisville, is given in Table 2, Appendix E.

Record Drawings.

Record drawings have been made of all sewers, appurtenances and special structures built by the Commission. These drawings are on sheets of vellum 18 inches by 24 inches in size. These drawings, grouped and bound by contracts and filed in a case of drawers, have been turned over to the city. Blue prints of the record drawings made upon cloth and bound in four books, have also been turned over to the city and are intended for ordinary, frequent reference of the Engineers' Department. Additional prints can be made from the record drawings from time to time as they may be required.

PART TWO.

Construction.

The work of the past three years has included the engineering and inspection required by the work done under the contracts and the day-labor work previously referred to in this report. These undertakings are described briefly under their respective headings.

Southern Outfall Sewer.

PORTION OF SECTION "D."—This contract covers the construction of the sewer in Wilson Avenue between Twelfth and Fifteenth Streets. It was included in Contract No. 11 originally awarded to The Weber Company, but was taken away from that company because of unsatisfactory progress and was awarded to T. B. Jones & Co., the lowest bidder in the reletting. This contract was completed August 6, 1910.

The average amount of excavation per week was 980 cubic yards, and the greatest amount in any one week was 2,878 cubic yards. The average quantity of concrete placed was 77.7 cubic yards per week and the greatest amount was 149.8 cubic yards.

This work was quite fuly described in the Report of 1910.

SOUTHERN OUTFALL CONTRACTS COMPLETED.—Contracts for Sections "A," "C," "D," "E," "F," and "G" were completed during the year 1910, although upon several of them but little work was done. These contracts were fully described in the Report of 1910.

South Louisville Branch Sewer.

SECTION "A."—This section was included in the contract for Section "G" Southern Outfall Sewer.

SECTION "B."—This contract was completed August 12, 1910. The average quantity of excavation per week was 1,423 cubic yards and the greatest amount excavated in any one week was 2,615 cubic yards.

The average quantity of concrete placed per week was 98.7 cubic yards and the greatest quantity was 179.29 cubic yards.

SECTION "C."—This contract was completed on September 30, 1910. The average quantity of excavation per week was 882 cubic yards and the greatest quantity was 3,606 cubic yards.

The average quantity of concrete placed per week was 81.9 cubic yards and the average amount in any one week was 181.9 cubic yards.

These contracts were fully described in the Report of 1910.

Brook Street Sewer.

This contract was signed by C. T. McCracken & Co., of Columbus, O., May 11, 1910, the amount of the proposal being $102,643.37.

This is a branch of the Southern Outfall extending from Avery Avenue through Brook Street to the Southern Railway crossing; thence easterly through a right of way to Floyd Street; thence in Floyd Street to a point near the city limits.

This sewer is of the three-centered arch shape, 10 ft. wide by 7 ft. 6 inches high, and is 5,198 ft. in length. It is built of reinforced concrete.

At the intersection of Brook Street and Avery Avenue a junction chamber was constructed. This chamber is so built as to permit the construction of the Overflow Drain to Beargrass Creek at a point near Kentucky Street, as described in Part One of this report. The flow of the Dry Run is taken into this sewer at three points—one at the shop yard of the L. & N. R. R., one at the end of the sewer at a point near the city limits, and one at an open inlet immediately south of G Street.

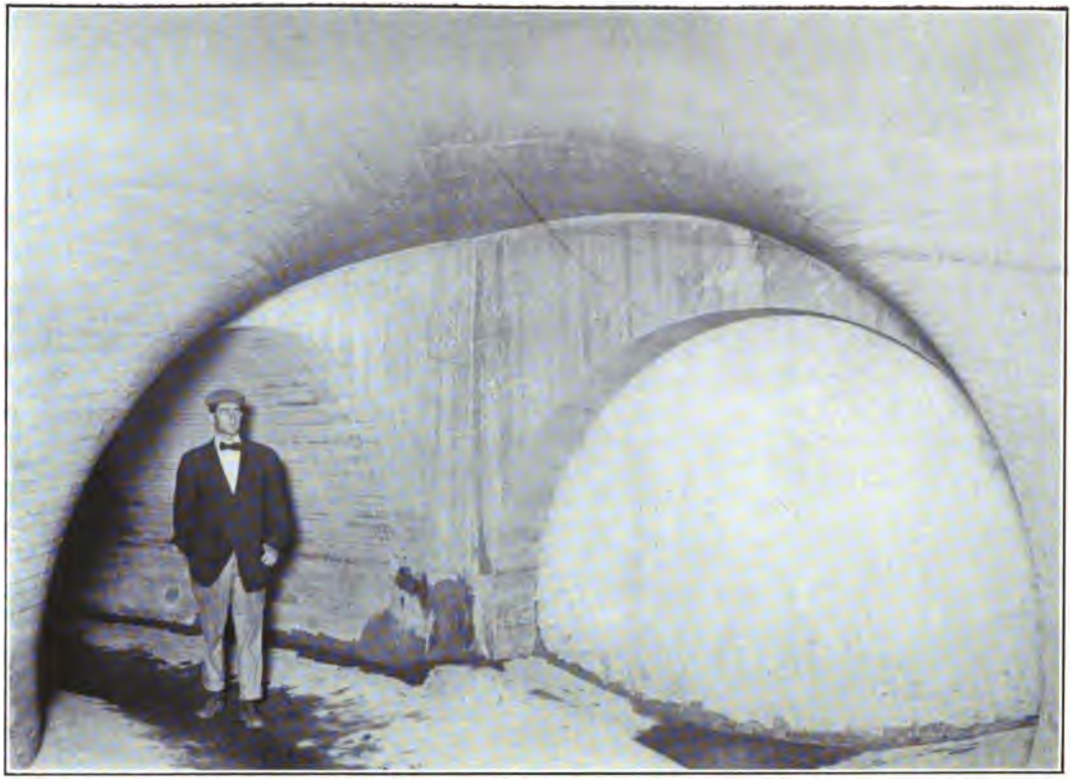
The excavation was in gravel, sand and clay, varying in depth from 10.4 ft. to 23.2 ft. and averaged 16.6 ft. The work was prosecuted at two openings, the excavation being done by means of clam shell and orange peel buckets, carried by traveling stiff-leg derricks. The average length of trench excavated to grade was 141.6 ft. per week and the greatest length in any one week was 465 ft.

The concrete was machine mixed and the sewer was built in two operations. The average quantity of concrete placed per week was 159.6 cubic yards, and the greatest amount in any one week was 327.9 cubic yards.

Blaw steel centers and wooden back forms were used upon this work and wooden forms covered with sheet iron were used upon curved and other special work.

On September 1, 1910, after a very heavy rainfall, Dry Run was in flood and overtopped its banks. The water found its way into the sewer and caused considerable damage to the contractor and consequent delay. Another freshet occurred on October 5th and 6th with similar results.

For a distance of about 1,150 ft. the material in the bottom of the trench at grade was so soft that it was necessary to excavate below grade and refill with gravel. This excavation was carried to a depth of from 1 to 3 feet. The



Junction Chamber at Brook Street and Avery Avenue for Overflow Drain from Brook Street sewer to Beargrass Creek.

foundation provided in this way proved to be satisfactory. This additional excavation and gravel refilling was the principal cause of the increase in cost of this work above the amount of the proposal. This work was completed March 14, 1911.

Beargrass Intercepter.

SECTIONS "C-2," "C-3," "D," AND "E."—The contracts for these sections were fully described in the Report of 1910. All of the work embodied in these contracts was completed during that year.

The original contractor for Section "C-3" was unable to complete the work and it was carried to completion by the United Surety Co. of Baltimore, Md., surety on the contract.

The contractor for Section "E," was unable to complete the work, which was carried to completion by the U. S. Fidelity & Guaranty Co. of Baltimore, Md., surety on the contract.

SECTION "F"—CONTRACT NO. 60.—This contract was signed by the Blackstaff Engineering Company, Incorporated, of Philadelphia, Pa., January 31, 1910, the amount of the proposal being $34,226.22.

The sewer to be built under this contract extends from the junction of Dupuy and Kentucky Streets across Kentucky Street; thence southerly in Schiller Avenue to Ellison Avenue; thence in a southerly direction in a right of way through St. Michael's Cemetery to the west bank of the South Fork of Beargrass Creek.

It is 3,200 ft. in length, circular in shape and of two sizes—39 inches and 33 inches in diameter. The excavation was in yellow and blue clay and varied in depth from 10 to 30 ft.

The contractor began work in two places—at Kentucky Street and near Ellison Avenue. It was his intention to construct the northerly portion of the sewer in tunnel and with this in view he designed and constructed a steel shield and a system of sheeting which was used for a distance of about 25 ft. from a shaft sunk at the junction of Dupuy and Kentucky Streets. This part of the work was attended by so much difficulty that the attempt to tunnel was discontinued and no sewer was built in the tunnel by this contractor.

South of Ellison Avenue the work was carried on in trench, the excavation being done by means of an orange peel bucket and traveling derrick. About 660 ft. of trench was excavated to grade and about 570 ft. of 33 inches circular sewer was constructed. This portion of the sewer was built of plain concrete and was supported upon a plank platform because of the instability of the foundation.

The contractor stopped all work on this contract July 16, 1910, and abandoned the contract. The work included in this contract was completed under Contract No. 73.

SECTION "F"—CONTRACT NO. 73.—This contract was signed September 28, 1910, by Henry Bickel Co., of Louisville, the amount of the proposal being $51,363.55. The location of the sewer and the sizes are given under Contract No. 60.

The contractor made several openings, using two cableways, two derricks with orange peel buckets and also doing a portion of the work in tunnel. All concrete was mixed by hand.

The portion of the sewer which is 39 inches in diameter was constructed of reinforced Portland cement concrete and is 940 ft. in length. Including the 25 ft. of tunnel driven under contract No. 60, 264 ft. of this sewer was built in tunnel. The tunnel was driven in the usual manner and braced by the cap and leg method. The precaution was taken of placing cross braces between the legs below the sewer sub-grade. No difficulty was experienced in driving these tunnels, the material excavated being sufficiently stiff to stand in the headings without bulkheads.

The sewer 39 inches in diameter was constructed in accordance with the standard design for soft ground. A portion of it was built upon a plank foundation and some of the plank were bedded upon gravel to insure a firm and even bearing. A shaft was sunk at the point where the sewer is reduced in size from 39 inches to 33 inches in diameter and two attempts were made to drive tunnels from this shaft. These efforts did not meet with success, because of the instability of the material excavated, and this portion of the sewer was constructed in open cut. That portion of the sewer which is 33 inches in diameter was constructed of plain concrete and was built entirely in trench. The total length of this portion was 2,260 ft., 1,664 ft. of which were constructed on timber foundation, 572 linear feet being placed under Contract No. 60.

The required date of completion of this contract was June 25, 1911. Excellent progress was made so that all work was completed February 3, 1911, with the exception of the street paving, which was postponed until the following April by the direction of the Commission.

Connections to Beargrass Intercepter.

Ten regulator connections with the Beargrass Intercepter have been constructed and put into operation. As stated elsewhere in this report, the regulators are for the purpose of controlling the flow into the Beargrass Intercepter from the various contributing combined sewers. Commencing with the connections farthest down the stream and taking them in the order in which they will be found as one passes up the line of the Intercepter, their construction will be briefly described in the following paragraphs:

WEBSTER STREET SEWER CONNECTION.—This connection was started on July 17, 1911, by a day labor force under the direction of Mr. F. C. Williams, Resident Engineer, and E. J. Clerget, Superintendent. The route of this connection is as follows: Starting from the Beargrass Intercepter in the north sidewalk of Main Street, it runs easterly in Main Street for a distance of about 170 feet and thence in private property along the west bank of Beargrass Creek to Webster Street, there intercepting the dry weather flow of the Webster Street Sewer through a regulator of the large type. The sewer is of vitrified pipe, 756 feet of it being 20 inches in diameter and 590 feet of 18 inches in diameter, ending in the regulator chamber in Webster Street. The material encountered in the excavation was a yellow and blue clay and cinder fill. That portion of the sewer within the limits of Main Street was built in tunnel as was also a section 104 feet in length under the Water Street Branch of the L. & N. Railroad. At these points the material was fairly firm clay so that the tunneling, done by the cap and leg method, presented no serious difficulties. For a considerable distance, the excavation was rendered particularly difficult by reason of the fact that the line of the sewer was through the sloping bank of the creek and the material excavated was largely a cinder fill which was loose and unstable. In addition to intercepting the sewage from the Webster Street Sewer, connections have been made to intercept the wastes from the packing houses on the west bank of the creek adjacent to the line of this connection.

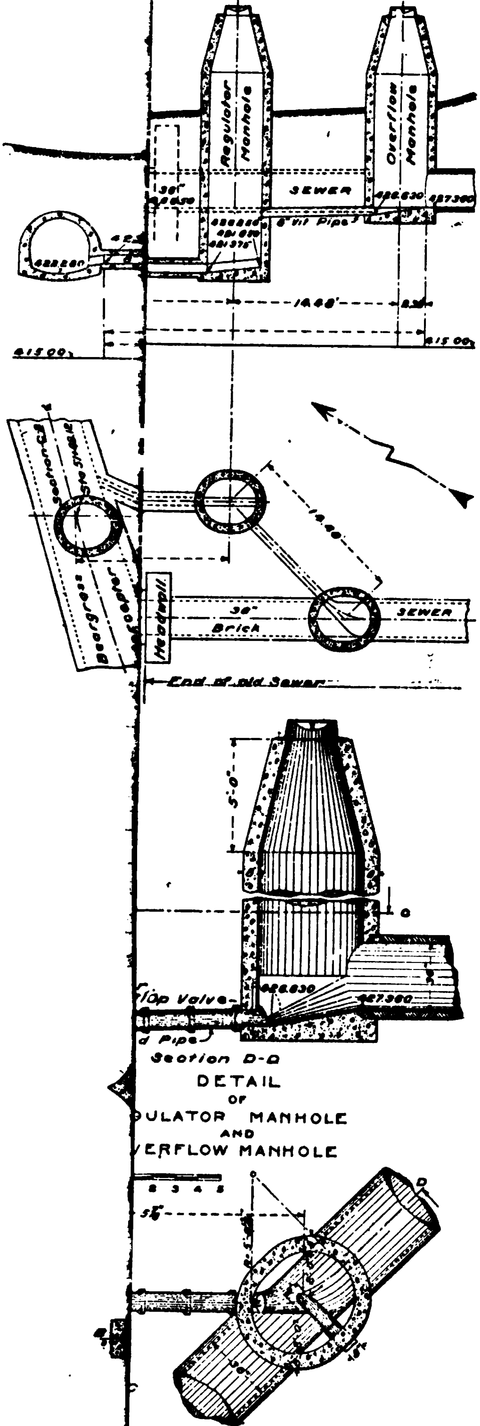
This connection was completed on February 26, 1912.

COOPER STREET SEWER CONNECTION.—The Cooper Street Sewer connection was started in April, 1910, by a day-labor force under the direction of Mr. H. S. Morse, Resident Engineer and Sidney Smith, Superintendent. The Cooper Street Sewer was formerly built to discharge sewage and storm water into Beargrass Creek a few hundred feet northeast of Baxter Avenue. Details of this connection are shown upon Plate C. This sewer was built just above the natural rock and the excavation was comparatively shallow so that the only difficulties met with were caused by the flow of water and sewage in Beargrass Creek and in the Cooper Street Sewer.

This connection was completed October 1, 1910.

GREEN STREET SEWER CONNECTION.—This connection was made by a day-labor force under the direction of Mr. H. S. Morse, Resident Engineer and E. J. Clerget, Superintendent. The work was started on October 7, 1910, and completed December 15, 1910. As the Beargrass Intercepter passes under the Green Street Sewer below the introduction of any sewage into the latter, the connection was very short. The details of the connection are shown upon Plate B.

PLATE-C.


Regulator Manhole
Overflow Manhole
36"
SEWER
426.630
427.360
8" Vit Pipe
14.48'
415.00
415.00
Section C-C
Beargrass Creek
Headwall
36" Brick
SEWER
End of old Sewer
5'-0"
Flap Valve
426.630
427.360
d Pipe
Section D-D
DETAIL
OF
ULATOR MANHOLE
AND
ERFLOW MANHOLE
2 3 4 5
D

PHOENIX HILL SEWER CONNECTION.—This connection was made by a day-labor force under the direction of Mr. H. S. Morse, Resident Engineer and Sidney Smith, Superintendent. The work was commenced in December, 1909, and finished in May, 1910. The Phoenix Hill Sewer discharged into Beargrass Creek from the east at the second alley southwest of Baxter Avenue. This connection in all its details is almost identical with that of the Cooper Street connection. In this work, however, the pipe was laid for practically its entire length in a rock cut. The depth of the cut in the rock averaged about 2 ft. which, with the earth above, made a total average cut of about 7 ft. This work was done in a similar manner to that of Cooper Street, the flow in the creek being confined to one side while the sewer was being constructed on the other side.

CONNECTION OF THE BRENT STREET SEWER AND SEWER IN BROADWAY EAST OF BEARGRASS CREEK.—The connection for these two sewers was constructed by a day-labor force under Mr. H. S. Morse, Resident Engineer, E. J. Clerget, being Superintendent. This work was started December 27, 1910, and completed March 13, 1911. This connection is the third in which an inverted siphon was required in order to provide for the construction of the improved channel for Beargrass Creek, the other two being the Cooper Street and Phoenix Hill Sewer connections, already described. The Brent Street and Broadway Sewer connection is 570 ft. long and is composed of an 18-inch pipe starting from the Beargrass Intercepter at the first alley north of Broadway, thence running easterly crossing Beargrass Creek in this alley and turning to the south, crossing Broadway, there intercepting the Broadway Sewer and continuing to Brent Street Sewer near the intersection of Brent Street and Beargrass Creek. Between the Broadway Sewer and the Brent Street Sewer, a 15-inch pipe was used. The siphon below the proposed location of the improved creek channel was built of 16-inch cast iron pipe on the westerly end of which was placed the regulator chamber. Between the regulator chamber and Beargrass Intercepter a 6-inch tell-tale pipe was laid by means of which the float in the regulator chamber will rise and fall in accordance with the height of the water in the Intercepter. A clean-out chamber was constructed on the easterly side of the proposed channel and arrangements made for emptying and cleaning the siphon whenever that may become necessary. At the intersection of the Broadway Sewer a flap valve was inserted in order to shut off the sewage from the Broadway and Brent Street Sewers when it is necessary to clean the siphon. On account of the elevation of the Brent Street Sewer at its outlet into Beargrass Creek, the construction of a tide gate was necessary between this outlet and the point of intersection with the connecting sewer. This tide gate will prevent an inflow of creek water through the connecting sewer from Beargrass Creek which would occur whenever there is any considerable flow in the creek but will open by the pressure of water in the Brent Street Sewer in times of storm and thus allow the storm flow to pass in its old course to Beargrass Creek.

The depth of excavation for this work was for the greater part of its length between 12 and 19 ft., although at the present location of the creek the depth was but 4 ft. Considerable trouble was encountered from ground water as the material excavated in the neighborhood of the creek was water bearing gravel. On this account, a steam pump was used for about two weeks. In order to interfere with travel on Broadway as little as possible, the sewer was constructed in tunnel under the street railway tracks and the southerly shoulder of the street.

EAST BROADWAY SEWER CONNECTION.—Connection with this sewer was made as a part of the contract for Section "C-3" of the Beargrass Intercepter, T. J. O'Connell, Contractor. As the Beargrass Intercepter crosses under the East Broadway Sewer, connection was made very readily by means of a short length of connecting sewer in which was placed a regulator chamber. The total length of this connection is about 42 feet and lies wholly within the northerly half of the carriageway of Broadway. The details of the regulator chamber are similar to those shown in the Green Street connection.

DRY RUN SEWER CONNECTION.—This connection was built by a day-labor force under the direction of Mr. H. S. Morse, Resident Engineer, Sidney Smith being Superintendent. This work was commenced January 4, 1911, and was completed on February 25 of the same year. The Dry Run Sewer is the largest sewer crossed by the Beargrass Intercepter. The connection was built at the intersection of Caldwell and Logan Streets at which point the intercepter passed under the Dry Run Sewer. The regulator was modified by the enlargement of the nozzle through which the sewage passes, making this nozzle and the connection equivalent to an opening 2 ft. square. A sluice gate was built at a point where the connection leaves the Dry Run Sewer by which the sewage could be admitted to or shut off from the connection.

The Dry Run Sewer at the point where it enters Beargrass Creek is at such an elevation with reference to the creek bed that water ordinarly stands at a depth of over 2½ ft. above the sewer invert. On this account, water from the creek might pass into the Dry Run Sewer, thence to the Beargrass Intercepter unless some means were taken to prevent it. Accordingly, within the city yard on Logan Street, through which the Dry Run Sewer passes, a section of the sewer was replaced by a reinforced concrete chamber in which was set a tide gate built in three sections which will allow the storm flow to pass through to the creek but prevent the creek water from entering the sewer. This chamber is 19 ft. long and the gate sections each 6 ft. 2 in. long by 3 ft. 6 in. wide. The construction of this chamber was also done by day-labor force a few months following the completion of the Dry Run Sewer connection, under the direction of Mr. F. C. Williams, Resident Engineer.

SNEAD'S BRANCH SEWER CONNECTION.—This connection was made by a day-labor force under the direction of Mr. F. C. Williams, Resident Engineer and Sidney Smith, Superintendent. This work was commenced on February 25, 1911, and completed about April 15, 1911. The location of this connection is immediately west of Underhill Street on the southerly bank of the creek at which point the intercepter passes under the Snead's Branch Sewer. The regulator is similar to that in the other larger connections but the connection itself differs inasmuch as the dry weather flow from the sewer is taken by an 18-inch pipe tapping the sewer from below instead of from one side as has been usually the case. As has been done in all the regulators below this point, a gate valve was installed on the connecting line between the main sewer and the regulator chamber. By this means all sewage can be shut off from the connection, making it possible to do all cleaning required.

SOUTHEASTERN SEWER CONNECTION.—This work was done by day-labor under the direction of Mr. H. S. Morse, Resident Engineer. This work was commenced June 1, 1910, and finished October 5, 1910. The Southeastern Sewer discharged into Beargrass Creek near the point where Rufer Avenue, if extended, would intersect the creek. The intercepter passes through Schiller Avenue on the opposite side of the creek and a little over 300 feet west of it.

The connection is 409 feet in length, built of 18-inch vitrified pipe laid with sulphur-sand joints. Immediately below the creek bed this sewer is surrounded with concrete. The regulating chamber is built upon the easterly side of the creek about 20 feet from the main sewer. Unusual difficulties were met with in the construction of this sewer owing to the nature of the material through which it was built. This material was a clay containing a considerable amount of ground water. The depth of the connection varied from about 3 ft. immediately below the creek bed to 26 ft. at the Beargrass Intercepter where the greatest difficulty was encountered. For 100 ft. at this end, the foundation was improved by the use of a thick layer of gravel.

CASTLEWOOD SEWER CONNECTION.—This connection was constructed as a part of Section "A," Castlewood Sewer, Henry Bickel Co., Contractor, and a description of the connection is given in connection with the work done under that contract.

Northeastern Trunk Sewer.

SECTIONS "A" AND "B."—Cntracts for these two sections of the Northeastern Trunk Sewer were fully described in the Report of January, 1910. The Massachusetts Bonding and Insurance Company, surety on the contract for Section "A," was obliged to take over this work in October, 1910, and all work was completed February 28, 1911.

The work upon Section "B" was completed April 1, 1910.

SECTION "C."—The contract for this section of the Northeastern Trunk Sewer was signed by the Henry Bickel Co., of Louisville, July 9, 1910, the amount of the proposal being $19,572.48.

This portion of the trunk sewer is substantially parallel to the Edwards' Pond Branch and in or near Letterle Avenue. Beginning in Letterle Avenue near the outlet of the Vernon Avenue Sewer it extends to a point about 200 ft. east of Vernon Avenue; thence in a location through private property on the south side of Letterle Avenue, returning to Letterle Avenue at a point about 500 ft. east of Ewing Avenue; thence easterly in Letterle Avenue, a distance of 350 ft.

The sewer is 3,280 ft. long, circular in shape, and 24 inches, 20 inches and 18 inches in diameter.

The excavation was in yellow and blue clay, gravel and rock, the depth varying from 12 to 20 ft. The earth excavation was done by hand and by teams. The drilling for the rock excavation was done by drills operated both by steam and air. The air drills made fully double the progress of the steam drills working in similar cuts. The concrete was mixed by hand.

The sewer which was 24 inches in diameter was constructed of plain concrete. The 18-inch and 20-inch sewers were of vitrified pipe with sulphur-sand joints. In the construction of the 24-inch sewer galvanized iron centers designed by the contractor were used successfully, the sewer being built in one operation.

As a part of this contract connections were made with the 12-inch sanitary sewer at Jane Street and the 8-inch sanitary sewer at Ewing Avenue.

At the point where the sewer crosses Edwards' Pond Branch in Letterle Avenue a small siphon was constructed, consisting of a 16-inch and a 20-inch cast-iron pipe incased in concrete. A small clean-out chamber was built at the inlet end of the siphon and provided with an outlet pipe to the branch. Stop planks were also provided with which to divert the flow from the siphon to the creek in case of emergency for the purpose of cleaning or repairs. At the lower end of the siphon the pipes discharge into a manhole.

This contract was completed November 3, 1910, about one month earlier than the time fixed in the contract.

SECTION "D."—The contract for this section was signed July 5, 1910, by Frank Schefold, of New Albany, Ind., the amount of the proposal being $9,865.79.

This sewer is located in Letterle Avenue and extends from a point about 900 ft. easterly of Ewing Avenue to Crescent Avenue. It is 3,140 ft. long and is built of vitrified pipe 15 inches, 18 inches, 20 inches and 22 inches in diameter. All pipe joints were run with the sulphur-sand mixture fully described in the Report of January, 1910.

The excavation was in yellow and blue clay and rock and varied in depth from 5½ to 12½ ft. All excavation was done by hand and steam drills were used for drilling.

As a part of this contract connections were made with the Aubin Avenue and Crescent Avenue sewers.

The sewer passed under and close to three culverts crossing Letterle Avenue. At the first or most westerly of these culverts, the vitrified pipe was incased in concrete. At the other two culverts iron pipe was substituted for the vitrified pipe.

This contract was completed November 2, 1910.

Northeastern Drain.

SECTION "B."—This drain was built by a day-labor force under the direction of Mr. F. C. Williams, with A. D. Campbell as Superintendent. The work was started March 4, 1912, and completed after some interruption in the following July.

This construction was for the purpose of draining a stagnant pond, of about 1½ acres lying between Campbell and Mill Streets and supplying a suitable outlet for the Campbell Street Sewer.

The drain is of plain concrete 36 inches in diameter and 700 ft. long. It is an extension of the improvement of the old bed of Beargrass Creek previously made in connection with the construction of Section A, Northeastern Sanitary Sewer. The new construction extends on the northerly side of the L. & N. R. R. from the Beargrass Intercepter immediately east of Mill Street to Campbell Street. At the Beargrass Intercepter, this drain replaced a portion of a reinforced concrete siphon built below the intercepter at the time of its construction. The east leg of the siphon was removed in the construction under the contract for Section A of the Northeastern Sewer, so that now the drain has a continuous fall to the culvert through the Cut-off Embankment.

The material excavated was a blue or grey clay of varying degrees of firmness and a loose fill made for the Big Four R. R. Connection. The weight of this fill, which was nearly all south of the trench, was the cause of a good deal of hindrance and expense to the work. It caused a movement in the sides of the trench interfering with the placing of the concrete structure. For this reason, the section was strengthened by the addition of an extra amount of concrete at its base, making in effect heavier abutments.

The concrete mixing as well as the excavation was done by hand. In addition to the construction of the drain proper, about 20 ft. of the Campbell Street Sewer was relaid and several hundred feet cleaned. A 12-inch branch pipe was laid to the old culvert crossing Campbell Street.

Middle Fork Sewer.

SECTION "B."—This contract was signed by A. F. Helm, of Cleveland, O., May 27, 1910, the amount of the proposal being $29,259.80.

This sewer is located in the Workhouse Road extending from a point near the outlet of the Cave Hill Cemetery

Sewer and Drain, easterly along the south bank of the Middle Fork of Beargrass Creek to a point approximately 800 ft. east of Spring Street; thence under Beargrass Creek to the north bank of the Creek and thence easterly along this bank for a distance of 1,300 ft. This sewer is 2,960 ft. in length, circular in shape, 36 inches in diameter, and is constructed of plain Portland cement concrete.

The excavation was in yellow and blue clay, varying in depth from 6 to 20 ft. Much water was encountered west of the siphon under Beargrass Creek.

All excavation was done by hand. Most of the concrete was mixed by hand, although that which was placed in the siphon was machine mixed. In portions of the sewer which were in close proximity to Beargrass Creek and where it was anticipated that large quantities of ground water might be encountered, a small quantity of fine moulding sand was added to the concrete, making it more impervious to water. This sewer was constructed in accordance with the standard soft ground section, but no special foundation was necessary at any point.

The sewer crosses the Creek by means of an inverted siphon terminating at each end in a concrete regulating chamber. The siphon consisted of three vitrified pipes, 12 inches, 24 inches, and 30 inches in diameter respectively. These pipes were imbedded and surrounded by a mass of concrete so as to form a single structure. The chambers were provided with stop planks by means of which the flow of sewage can be turned into any of the pipes desired, or entirely shut off, and turned into Beargrass Creek through an emergency outlet constructed from the inlet or up-stream chamber of the siphon to the creek.

It is intended that the smallest of these pipes shall be used as long as it is of sufficient capacity to provide for the quantity of sewage flowing. When there is sufficient sewage to overtax this pipe the flow should be transferred to the next larger pipe which should be used until such time as the flow is in excess of its capacity, when the largest pipe may be put into service and the other two temporarily thrown out of use. By properly selecting the pipes to be used in connection with the quantity of sewage flow, it will be possible at all times to provide sufficient velocity through the siphon to prevent deposits and keep it clean.

About 500 ft. from its upper end, the sewer crosses over a small run draining a portion of Crescent Hill. A culvert was constructed at this point through which the flow in the run is carried under the sewer to Beargrass Creek. Across the culvert the sewer is constructed of cast-iron pipe.

Work upon this contract was completed December 8, 1910, 15 days ahead of the time required by the contract.

SECTION "C."—The Henry Bickel Co., of Louisville, signed this contract January 18, 1911, the mount of the proposal being $21,337.00.

This sewer is located in the valley of the Middle Fork of Beargrass Creek in a general way parallel to the north bank of the creek. It extends from the upper end of Section B, about 2,200 feet east of the point where Spring Street crosses the creek, and ends at a point about 160 feet west of Long Avenue now Raymond Avenue. The sewer is 2,693 feet in length, of circular section, and 33 inches in diameter, and is constructed of plain Portland cement concrete.

The material excavated was yellow, brown and blue clay and rock. A length of 560 feet of the sewer was constructed in tunnel. The remaining portion was built in open trench, the depth of excavation varying from 5 to 14 feet. All earth excavation was done by hand. There was but one outcropping of rock through which the trench extended for a distance of about 100 feet. Steam drills were used in the excavation of this rock. Throughout the work the character of the material in the bottom of the trench was firm so that no special foundation was required for the sewer.

In the construction of the sewer galvanized iron centers with wooden ribs were used, the sewer being built in one operation. Concrete was mixed both by hand and machine. At a point about 90 feet from the upper end, the sewer crosses a small branch, and is supported by three concrete piers, thus forming a double-barreled culvert to carry the natural flow of the stream.

Work on this contract was completed April 26, 1911, 112 days before the date called for in the contract.

SECTION "D."—Proposals for the construction of this sewer were received August 4, 1911, but being considered too high, they were rejected and the Commission decided, upon written recommendation of the Chief Engineer, to do this work by day-labor.

The construction was commenced September 1st following under the direction of Mr. F. C. Williams, Resident Engineer, and completed February 20, 1912.

This was the last section built of the Middle Fork Sanitary Sewer. It is 30 inches in diameter, of plain concrete, and 3,480 feet in length. The sewer lies in private property adjacent to the Middle Fork of Beargrass Creek and extends from the junction of the Middle Fork and Long Avenue Sewers at a point opposite the intersection of Raymond and Long Avenues through the property of the Louisville Water Company and the Old Kentucky Distillery Company to Cherokee Park; thence in the park to a point about 500 feet south of Meadow Road. The lower part of the Alta Avenue Drain, about 100 feet long was also included in this work. It was built of concrete and was 27 inches by 45 inches in size.

At the crossing of Beargrass Creek in the Old Kentucky Distillery Company's property an inverted siphon composed of three iron pipes, 12 inches, 16 inches and 20 inches in diameter respectively, surrounded with concrete was substituted for the regular 30-inch concrete section. At either end of this siphon a concrete chamber was built for the regulation, inspection and cleaning of the siphon.

The construction was divided into two parts as nearly equal as could be estimated in advance and an independent gang employed on each.

All work on this section was done by hand with the exception of a small amount of excavation made with scrapers.

The excavation, which was either of blue or yellow clay, ranged in depth from 3.5 feet to 24 feet, although nothing over 18 feet was made in open trench. At Long Avenue, Spring Street and Meadow Road in Cherokee Park, for a total length of 217 feet the sewer was built in tunnel.

The work of greatest difficulty was the construction of the siphon crossing Beargrass Creek. The Creek was swollen considerably at times during the construction of this part of the work causing temporary suspensions as the by-pass channel dug for the purpose of diverting the flow outside of the work was insufficient to accommodate the heavy flow.

Weather conditions encountered increased the cost of the work above the preliminary estimate. The computed cost of the work if done by contract at the prices named in the lowest proposal was $19,935.75. The actual cost of day-labor of the corresponding amount of work was $18,804.41, so that a saving of $1,131.34 was made by construction with a day-labor force.

ENTERPRISE SEWER CONNECTION.—This connection was constructed by day-labor force under the direction of Mr. F. C. Williams, Resident Engineer, and E. J. Clerget, Superintendent. This work was commenced on March 17, 1911, and completed June 1, 1911. This connection, the only one upon the line of the Middle Fork Sewer connecting to an existing combined sewer, was of 18-inch vitrified pipe, 1,190 feet long, and laid with sulphur-sand joints. This connection leaves the Enterprise Sewer at a point about 30 feet from its outlet into the Middle Fork of Beargrass Creek, thence crosses the creek and runs in private property to the Middle Fork Sewer at a point about 500 feet west of Beargrass Avenue. The crossing of the creek is made in the form of an inverted siphon and is about 95 feet in length. The regulator chamber is built upon the southerly end of the siphon and upon the northerly end a chamber was built in which the siphon might be opened for inspection or cleaning. This siphon is composed of two lines of vitrified pipe, one 10 inches and the other 12 inches in diameter, incased in concrete. Sliding gates are provided at the inlet end of each pipe and a flap valve upon the outlet end so that either or both of the pipes may be put in operation at any time. In addition, a branch pipe leading from each siphon pipe in the regulator chamber and below the sliding gate allows an overflow into the second pipe when one only is set for use. An underdrain was found necessary for nearly the whole length but not enough water was encountered to give any serious trouble. A slight amount of rock excavation was required near the northerly end.

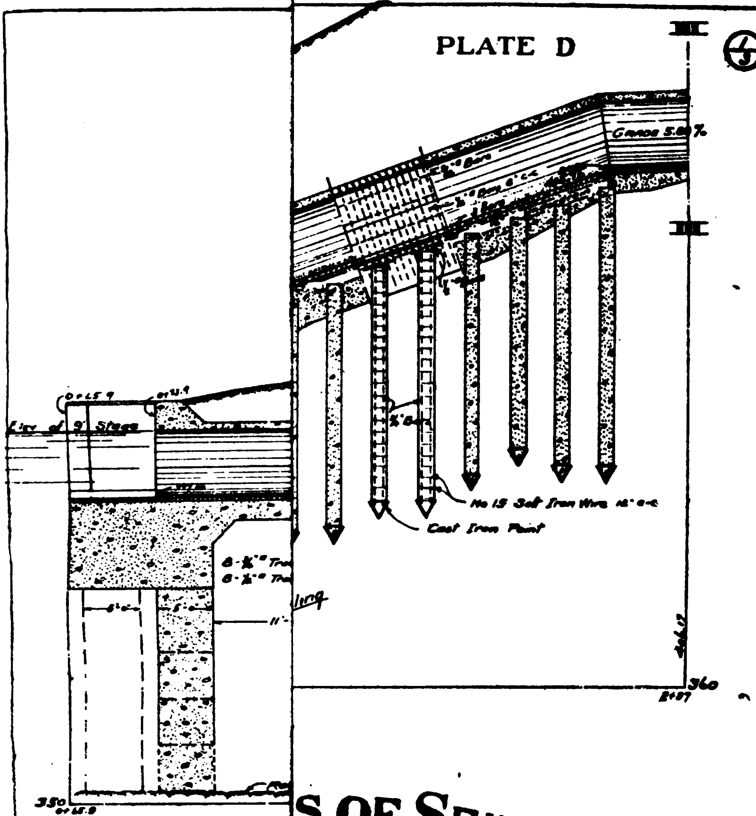
Northwestern Sewer.

SECTION "A."—The outlet of the Northwestern Sewer is below the elevation of the proposed 9-foot stage of the Ohio River. For a distance of 411 feet from the face of the head wall the sewer is horse-shoe shape, 6 feet 8 inches wide by 6 feet high. The elevation of the invert of the sewer at its mouth is 377. At the top of the bank of the Ohio River and easterly therefrom it is 13 feet 6 inches wide by 9 feet high. The elevation of the invert at the westerly end of this section is 421.58.

The total distance from the face of the head wall at the river to the end of the large section at the top of the bank is 431 feet, in which the total fall it 44.58 feet. The river bank consists of two slopes separated from each other by a nearly level beam about 150 feet wide. For a distance of 77 feet from the face of the head wall the sewer is laid on a one per cent. slope. From this point for a distance of 78 feet the slope is 35.96 per cent., and for a distance of 256 feet further, the sewer is laid upon a slope of 5.88 per cent. A reduction chamber 20 feet in length connects the upper end of this portion of the sewer with the sewer of larger section. The invert of the sewer at the upper end of this reduction chamber is over 40 feet below the surface of the ground.

The mouth of the sewer at the river is protected by the usual head and wing walls. The lower portion of the sewer rests upon concrete columns built within steel caissons.

PLATE D



S OF SEWERAGE
OF
VILLE, KY.
ACT No. 42

TERN SEWER

C. A
ND PROFILE
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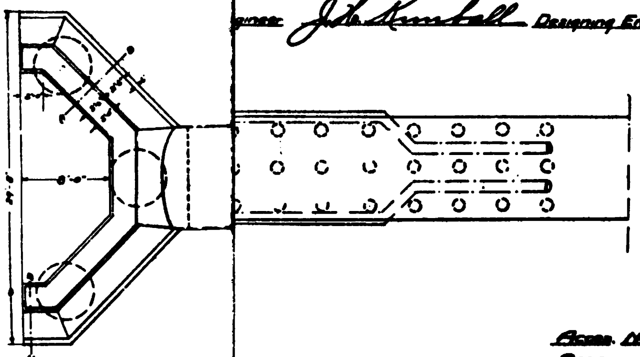


Accss. No. 1538
Case
Drawer

The steel shell forming each caisson is composed of sections 5 feet in diameter and four or five feet in length, made of quarter-inch plate. Each section, except the lowest which has a reinforced cutting edge at the bottom, is provided at each end with flanges. The completed caissons varied in length from twenty to twenty-five feet.

After excavating the trench to sub-grade the sinking of the caissons was begun by placing the first sections of the steel shells in correct position. Excavation was then begun inside the shells which gradually settled down as the earth was removed from below the cutting edge. From time to time, as the shells settled down, new sections were bolted on until the caissons were complete. At first the weight of the shell was sufficient to force it to the bottom of the excavation but as the friction became greater, due to longer length and increased earth pressure, it was necessary to use jacks reacting against the timbering of the trench and to drop a loaded bucket onto the top section by means of a derrick. Under favorable conditions a caisson could be sunk at the rate of four feet per day of ten hours.

Rubber gaskets were used between the horizontal flanges of the sections to prevent the leakage of water into the caissons which, if excessive, it was feared might wash the concrete as it was placed. Little water was encountered in the excavations although at times considerable found its way from the trench down the outside and under the edge of the caisson. This was always successfully handled by means of a 2-inch Nye pump which was carried on falls and lowered in the caisson as the excavation progressed.

Little difficulty was experienced in keeping the caisson plumb although care was exercised in this regard especially during the sinking of the first section.

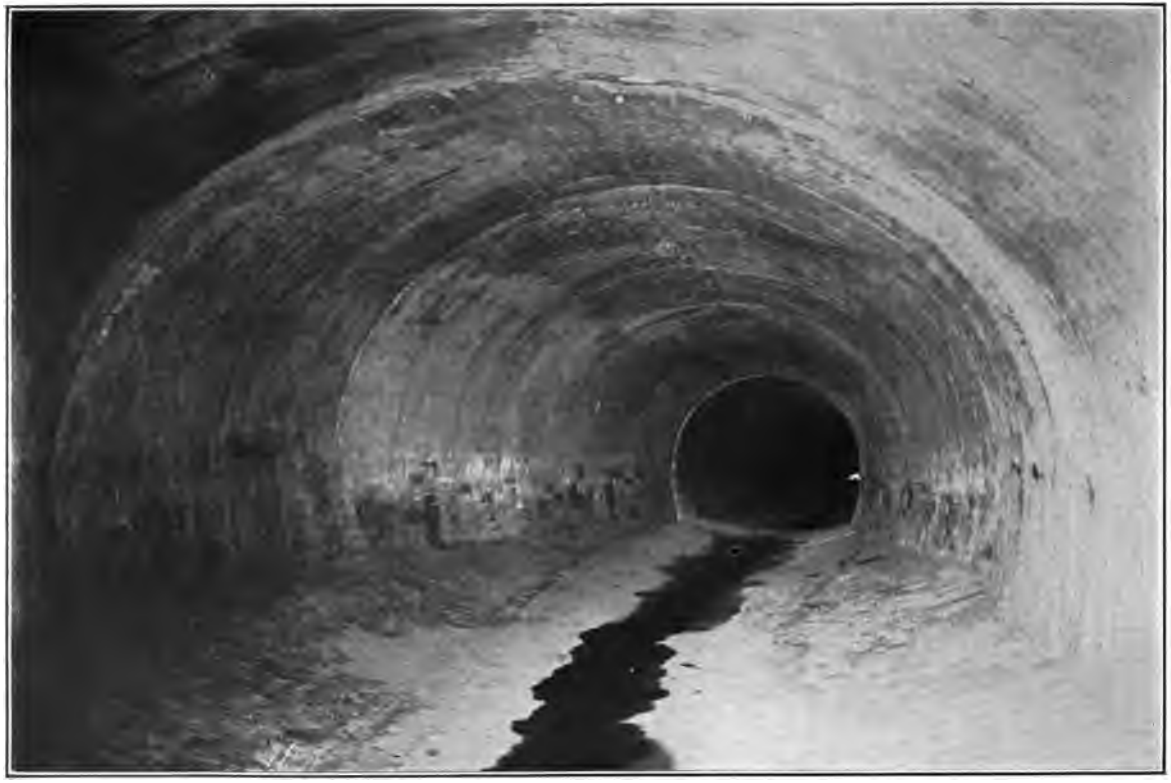
Twelve three-quarter inch steel bars, or the equivalent, were placed in each caisson five inches from the shell and brought up through the concrete into the cap of the column which constitutes a footing for the sewer. The sewer is constructed of reinforced concrete. The clear span between the caissons is 11 feet and between the tops of the column caps is 7 feet. The minimum thickness of the concrete of the invert of the sewer between the column caps is 2 feet and the under side is a plane parallel to the longitudinal axis and the horizontal diameter of the sewer. There are six columns under the barrel of the outlet structure and two under the wing walls. So much difficulty was experienced in driving the concrete piles for the drop chamber that the last four bents were omitted and one column substituted for them, making a total of eight columns constructed.

The drop chamber—the name given to the portion of the sewer laid on a slope of 35.96 per cent.—is constructed of reinforced concrete supported by Simplex concrete piles. These piles were constructed by the usual method, a steel casing 17 inches external and 15½ inches internal diameter, being first driven to ledge, or into firm gravel, and then withdrawn as the concrete was placed in it. The piles were reinforced with four ¾-inch twisted steel bars extending from the bottom and protruding from the top of the piles. These rods were bent parallel with the longitudinal axis of the sewer and imbedded in the concrete of the invert, thus securely tying the concrete of the sewer to the concrete of the piles. Above the drop chamber the sewer was constructed of reinforced concrete in the usual manner.

The invert and side walls of this portion of the sewer were faced with vitrified paving brick in order to provide a hard and tough surface to prevent any erosion by the storm water which will flow through it at a high velocity. The various features of the design of this sewer are shown upon Plate D.

The earlier work upon this sewer, which was begun by contract in 1909, and was subsequently taken over by the Commission to be completed by day-labor, was quite fully described in the last report which covered the work done to December 31, 1909.

Work was vigorously prosecuted in spite of cold weather and difficult conditions until January 7, 1910, when it was stopped by a sudden rise in the river which not only sub-



Section "B" Northwestern sewer in Shawnee Park near top of bluff of Ohio River.
Change in size from 13 feet 6 inches by 9 feet to 6 feet 8 inches by 6 feet.

merged the trench but also a portion of the plant. Work was, therefore, abandoned for a time and the stock of cement sold to the James Duff Construction Company.

During the latter part of April a small force was organized to overhaul the plant and prepare for starting the work. On the 29th, however, the river again rose and it was necessary to suspend operations. A further attempt was made to begin work on May 2d and 3d, but continued high water made it impossible to proceed. The river was high almost continuously until about August 1st, at which date it had fallen below the top of the cofferdam and it was decided to make another attempt to begin active construction. A force was accordingly organized early in August and the plant put into condition for use.

Considerable time was required to prepare the plant and clean out and rebrace the trench so that actual excavation within the caissons was not resumed until the latter part of August.

On September 7th the river again rose so as to submerge the trench and it was necessary to temporarily abandon further work upon the caissons. It was possible, however, to continue operations higher up the river bank in the trench. During the week ending September 17th, caisson No. 6 was sunk to its final position, which was about 2 feet above solid ledge. The excavation, however, was carried on through the rotten stone from the bottom of the caisson to solid ledge which was encountered at elevation 351. This excavation and the caisson were filled with concrete on September 17th.

On September 21st the river again rose, this time to elevation 386, and stopped all work in the trench for two days. Work was resumed on the 23d and caisson No. 5 was sunk to its final position, the bottom of the caisson being about 4 feet above solid ledge. The excavation from the bottom of the caisson to the ledge was carried through rotten rock with little difficulty. This excavation and the caisson above were immediately filled with concrete.

All work was again stopped on October 5th on account of rain and a rise in the river. The water reached a maximum elevation of 399.5, causing no damage other than the suspension of the work. Operations were resumed on October 10th, and excavation within caissons Nos. 7 and 8 was continued.

During the week ending October 22d, caisson No. 7 was carried to grade and filled with concrete. During the week ending October 29th, caisson No. 8 was carried to grade and filled with concrete. This was the last column to be completed.

Much trouble was experienced in the trench with ground water which poured from a gravel stratum in enormous quantities requiring at times as many as four steam pumps to keep it under control. The gravel stratum from which the water poured was about four feet in thickness and several feet above the bottom of the trench for the outlet structure, and above the river at ordinary stages, that is, at all times when the work could be prosecuted. This gravel stratum was about 55 feet below the top of the river bank and the plateau extending easterly therefrom.

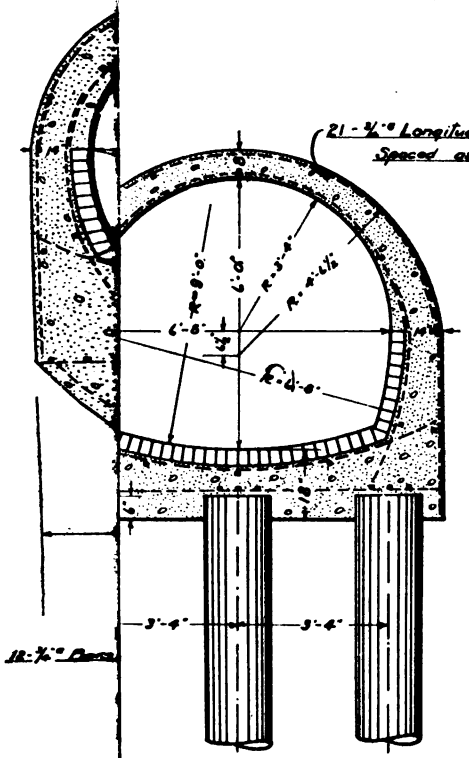
The masonry of this section was completed during the week ending December 24, 1910, and the remaining work was completed and grounds cleaned up February 4, 1911.

SECTIONS "B-1," "B-2," "C," AND "D."—This sewer and the contracts for building it were fully described in the report of 1910.

The work upon these sections was begun in the fall of 1909 and were completed during the year 1910.

At the angle in the sewer near Upper Paddy Run a short distance south of Chestnut Street, a diversion chamber has been constructed and connected with the upper end of the Western Intercepter. The invert of the Northwestern Sewer was depressed so as to discharge directly into the Western Intercepter. There was so little grade to spare, however, that it was necessary to build a low dam across the sewer to aid in diverting the dry weather flow into the intercepter. The elevation of the dam is such that the whole of the ultimate flow in the Northwestern Sewer will be di-

PLATE E.



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S OF SEWERAGE
OF
ILLE, KY.
ACT No 42

TERN SEWER
C. A
SECTIONS
ND SHEET

12-3/4"⌀ Designing Engineer J. H. Kimball Designing Engineer

Acces No 1540
Case
Drawer

verted into the Western Intercepter in dry weather. In times of storm when the flow in the Northwestern Sewer will exceed the capacity of the Western Intercepter, the excess flow will pass over the dam and be discharged directly into the Ohio River.

The Park Commission very kindly granted permission to build this sewer through Shawnee Park. While it is recognized that this work interfered in some measure with the use of the park by the public, every effort was made to keep the work at all times within reasonable limits and to leave the park in excellent condition upon completion of the contract.

One of the interesting features in the construction of Section C was the building of the sewer through the southerly portion of the pond west of Twenty-eighth Street. The contractor constructed a dike across the pond substantially parallel to the line of the sewer and pumped out the water south of the dike. He then constructed the sewer through the bed of the pond. Upon the completion of this sewer the pond, which has covered an area of approximately twelve acres, was completely drained.

The work upon Section D was abandoned by the original contractor and was finished by his surety, the National Surety Company.

Western Intercepter.

SECTION "A."—The contract for the construction of this section was signed August 25, 1910, the amount of the proposal being $45,225.56. The contractor was Guild & Co., of Chattanooga, Tenn.

This section of the Intercepter extends from the Southern Outfall at a point within the State Fair Grounds near Upper Paddy Run in a northerly direction through the State Fair Grounds and private property to Greenwood Avenue.

The sewer is circular, 60 inches in diameter, 3,239 feet long and is built of reinforced concrete.

The excavation varied in depth from 11 to 31 feet, averaging 19.6 feet. The materials excavated were loam and blue clay with some sand and gravel. No ground water was encountered.

The excavation was carried on at four different openings. Carson machines were used upon two of the openings, a stiff leg traveling derrick upon the third, while at the fourth opening the trench was excavated and backfilled by hand. All sheeting was driven and pulled by hand. The materials through which the excavation was made were of such a nature that skeleton sheeting could be safely used upon a large proportion of the work. During October, however, heavy rains caused a material flow in the run which crosses the line of the sewer. The trench was filled with water and thereafter it was necessary to drive tight sheeting. All concrete was mixed by hand. Full round collapsible wooden forms were used upon this work and the concrete was placed in two operations. The average quantity of concrete placed per week up to December 31st was 70.7 cubic yards and the greatest amount placed in any one week was 125.9 cubic yards. This section was completed March 21, 1911.

SECTION "B."—The data relating to this contract and a description of the work was given in the Report of January, 1910. The work was completed in June, 1910.

The intercepter passes under the Western Outfall in Broadway in tunnel. The distance between the underside of the Western Outfall and the top of the intercepter is about 3 feet. Excavation was carried to within a few inches to the underside of the brickwork of the outfall. No leak from it was at any time perceptible. All space in the tunnel outside the sewer was refilled with lean concrete, so that no future settlement of the outfall sewer or the street should take place.

WEST BROADWAY SEWER CONNECTION.—This connection was made by day-labor under the direction of Mr. F. C. Williams, Resident Engineer, and E. J. Clerget, Superintendent. This work was commenced May 29, 1911, and completed July 19, 1911. This connection is the only one outside of the Beargrass Intercepter district in which a regulator was used. Without this regulator the major portion of the capacity of the Western Intercepter would be taken up by the flow in the Western Outfall in times of moderate storms and the flow of the Northwestern Sewer might be forced to the Shawnee Park outlet. This regulator is of a large type with a large nozzle, the size of that used in the Dry Run Sewer connection. The total connection including the regulator chamber is about 45 feet long. Outside of the chamber, the connection is rectangular in shape, 2 feet square lined with vitrified brick. A sluice gate is provided between the regulator chamber and the main sewer in order to cut off entirely, if necessary, the flow from the Western Outfall. Excavation for this work was about 25 feet deep and the material was sand overlaid with yellow clay. This work was rendered somewhat difficult by the presence of the street railway track over the Western Outfall and by the danger of failure of a portion of this old brick sewer when its side was removed to allow the connection to be made. The opening for the connection extended from the bottom up to the springing line of the sewer, making necessary the support of the arch over the opening by means of steel I beams. As this sewer drains a territory of 1,400 acres, the minimum flow is considerable and some expense was entailed in caring for this quantity of sewage. The flow of the Western Outfall was turned into the Western Intercepter through this connection immediately upon its completion, thus removing from the foot of Broadway the nuisance present for a good many years, due to the discharge of a very large quantity of sewage at the river bank.

Thirty-Fourth Street Outlet.

This contract and the work done upon it were described in the Report of 1910.

The work which was stopped on account of high water in the Ohio River was resumed in August, 1910, by the United Surety Company, surety for the contractor.

This contract was completed March 15, 1911.

Twelfth Street Sewer.

This contract and the work done upon it in 1909 were fully described in the Report of 1910. The contract was completed in October, 1910.

A large proportion of the work done during the year consisted of repaving the street. The trench was on the east side of the car tracks and was so wide and caused so much settlement outside of the sheeting that it was necessary to repave the whole of the east side and a considerable proportion of the west side of the street, as well as a large portion of the east sidewalk.

This contract was carried to completion by the U. S. Fidelity & Guaranty Co., which was surety for the contractor.

Oak Street Sewer.

SECTION "A."—The contract for this sewer and the work done under it was fully described in the Report of 1910, and was completed March 30, 1910.

SECTION "B."—Plans and specifications for the construction of this sewer were prepared, advertised and bids were received, the lowest bid being $36,771.06. The engineer's estimate of the reasonable cost to the contractor of doing this work was $27,143.48. In view of the apparent high prices fixed by the lowest bidder, the Commission decided, upon written recommendation of the Chief Engineer, to proceed with this work by day-labor. Bids for this work were opened on July 8, 1910, and a day-labor force organized and work begun upon construction August 1, 1910, under the direction of Mr. F. C. Williams, engineer in charge of the work of the Southern Division. The work was completed November 19, 1910, 111 days after commencement, the time fixed in the original contract specifications having been 120 days.

This work included the construction of two sewers—one extending easterly from Tenth Street to Seventh Street, the other extending westerly from Twelfth to Fourteenth Street. The easterly branch is 1,525.4 feet in length and is

54 inches in diameter, between Tenth and Eighth Streets, and 27 inches in diameter between Eighth and Seventh Streets. The sewer 54 inches in diameter was built of plain concrete and the sewer 27 inches in diameter was built of vitrified pipe incased in concrete. The branch extending westerly from Twelfth Street is 42 inches in diameter and is 1,003 feet in length. It was built of plain concrete.

The excavation was in sand, clay and gravel, the depth varying from 8.2 feet to 24.5 feet and averaging 14.8 feet. All excavation was done by hand, the average amount being 851 cubic yards per week and the greatest amount in any one week was 952 cubic yards.

The concrete sewers were constructed in two operations, the concrete being mixed by hand. The average quantity of concrete placed per week was 78.4 cubic yards and the greatest quantity placed in any one week was 92.9 cubic yards. Blaw half-round steel centering and wooden outside forms were used.

After this work was completed and it was possible to determine accurately the quantities of work of the various classes performed, the contractor's bid was recalculated on the basis of these quantities and the original unit prices for comparison with the actual cost of doing the work by day-labor. The results of these calculations and the cost of the work were as follows:

Cost of work if done by contract	$37,955 84
Actual cost of work	29,163 61
Saving resulting from doing the work by day-labor instead of by contract	$8,792 23

The saving amounts to 23.18 per cent. of the calculated cost of the work if it had been done by contract at the prices bid by the lowest bidder.

Fifteenth and Twenty-Third Street Sewers.

This contract was signed May 10, 1910, by B. C. Milner & Sons, of Louisville, the amount of the proposal being $15,998.45.

This contract included two sewers—one in Fifteenth Street between Wilson and Ormsby Avenues, which is 473 feet in length and 54 inches in diameter, except that the drop connection with the Southern Outfall is 45 inches in diameter; the other in Twenty-third Street between St. Louis and Ormsby Avenues 613.3 ft. in length and 48 inches in diameter.

The excavation was in clay and sand and varied in depth in Fifteenth Street from 14.5 to 24 feet, averaging 16.5 feet. In Twenty-third Street the depth varied from 16.5 feet to 33 feet, averaging 22 feet. Part of the excavation was done by hand and on a portion of the work a stiff leg derrick and dump bucket were used. The backfilling was done by hand and by horse scrapers. The average amount of excavation per week was 381 cubic yards and the greatest amount in any one week was 930 cubic yards.

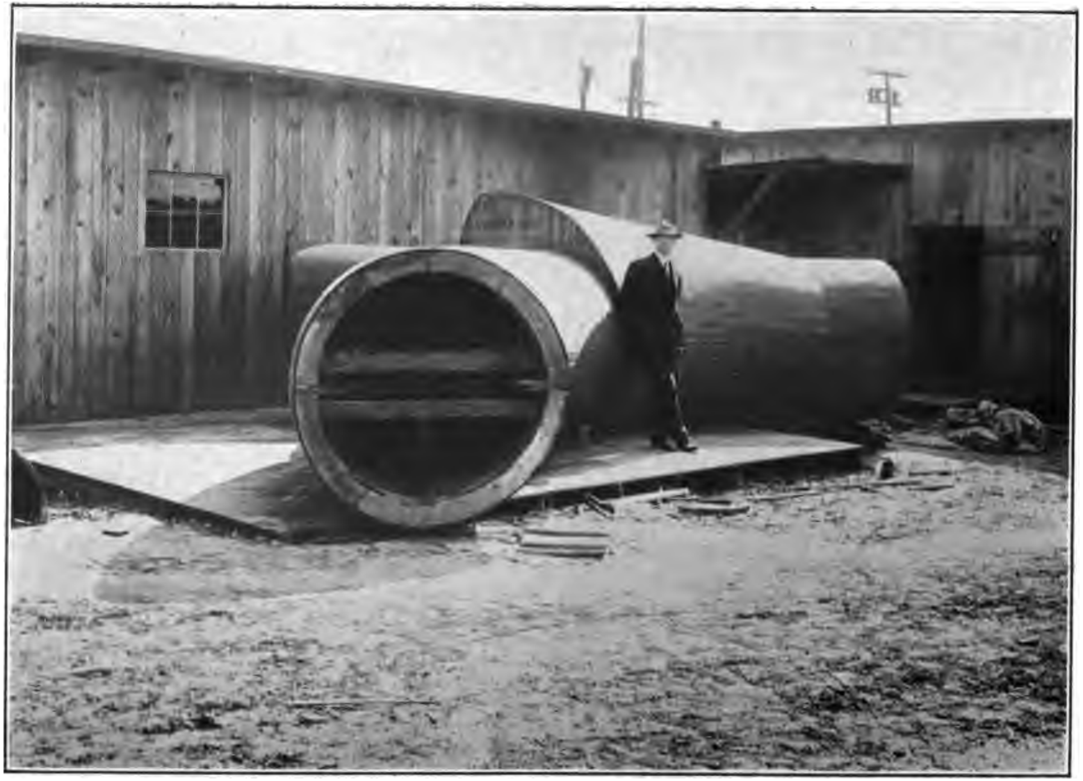
These sewers were built of plain concrete, a portion of which was mixed by hand and a portion by machine. The average quantity of concrete placed was 24.3 cubic yards per week, equivalent to 60 feet of completed sewer, and the greatest amount in any one week was 45.17 cubic yards, equivalent to 116.2 feet of completed sewer. The work included in this contract was completed October 1, 1910.

Seventh and Hill Street Sewers.

This contract was signed by Henry Bickel Co., of Louisville, Ky., May 11, 1910, the amount of the proposal being $25,559.83.

It included the construction of two sewers, one of which lies in Hill Street between Ninth Street and the alley west of Sixth Street, and is 1,217.6 feet in length. The other sewer lies in Seventh Street between Hill Street and Magnolia Avenue, and is 1,135.5 feet long. The sizes of the sewers constructed under this contract are 45 inches, 39 inches and 30 inches, all of plain concrete, and 18-inch and 12-inch both of vitrified pipe.

The excavation was in light loam, sand and clay. The depth of trench in Hill Street varied from 27 feet to 7.5 feet,



Wooden form for Junction Chamber at Twenty-first Street and Bolling Avenue. Diameter of main sewer 60 inches.

averaging 17.3 feet. In Seventh Street the trench varied in depth from 23 feet to 13 feet, averaging 14.8 feet. Two cableways were used upon this work, although much of the excavation was done by hand. The average length of trench excavated was 158.3 feet per week and the greatest length in any one week was 382 feet.

The concrete was all mixed by hand and the sewer was constructed in one operation. The average length of concrete sewer built per week was 165.9 feet, and the greatest length in any one week was 365.6 feet. Full round collapsible wooden forms constructed on the work were used. All work under this contract was completed October 24, 1910.

Twenty-First Street Sewer.

This contract was awarded to Guild & Co., of Chattanooga, Tenn., and signed January 18, 1910. The amount of the proposal was $32,335.08.

This sewer extends from the intersection of Twenty-first Street and St. Louis Avenue, at which point it connects with the Southern Outfall, southerly in Twenty-first Street to Bolling Avenue; thence easterly in Bolling Avenue to the lane east of McCloskey Avenue.

The total length of this sewer is 3,746 feet. It is circular in shape, the sizes being 57 inches, 60 inches, 48 inches and 39 inches in diameter. The portions of the sewer which are 57 inches and 60 inches in diameter are built of re-inforced concrete and the portions which are 48 inches and 39 inches in diameter are constructed of plain concrete.

The excavation was in clay and sand and no ground water was encountered. The trench varied in depth from 6.9 feet to 32.2 feet, averaging 13.4 feet. Work was carried on at three openings, upon two of which the excavation was done by hand. Upon the third opening a traveling stiff leg derrick, carried on tracks on one side of the trench was used for handling the buckets. All backfilling was done by hand or by horse scrapers. The average length of trench carried to grade per week was 138.7 feet and the greatest length was 265 lineal feet.

All concrete was mixed by hand and was placed in the forms in two operations. Blaw steel forms were used upon this work. The average quantity of concrete placed per week was 56.7 cubic yards and the greatest amount placed was 102.2 cubic yards.

The contract was completed October 11, 1910.

Dumesnil Street Sewer.

This contract was awarded to E. A. Barker & Son, of Louisville, Ky., September 17, 1909, and was completed April 9, 1910. This contract was fully described in the Report of 1910.

Thirty-Second Street and Dumesnil Street Sewers.

The contract for this sewer was signed by Henry Bickel Co., December 11, 1911, the amount of the proposal being $23,126.31. This combined sewer extends from the Southern Outfall Sewer in Woodland Avenue, through Thirty-second Street to Virginia Avenue with a branch in Dumesnil Street extending from Thirty-second Street to Beech Street. At Beech Street it was joined to and became the outlet for an old sewer extending easterly in Dumesnil Street, formerly intended to be used for storm water only but which had been used to some extent for the disposal of sanitary sewage. The new outlet provided in this way for the old sewer has, therefore, discontinued the nuisance arising from the disposal of storm water with an uncertain amount of sewage upon the lowlands between Dumesnil Street and Woodland Avenue adjacent to the Southern Railroad.

The Thirty-second Street Sewer was built of plain concrete of a lengeth of 1,454 feet—951 feet of which was 66 inches in diameter, the remainder being 60 inches in diameter. The Dumesnil Street branch, 850 feet in length, is 30 inches in diameter of plain concrete. The excavation in Thirty-second Street, the depth of which was from 19 feet to 24 feet, was of sand and gravel overlaid with yellow clay.

The first 8 feet was removed with wheel scrapers and on the remainder, orange-peel buckets operated by a stiff-legged traveling derrick were used. In Dumesnil Street, the excavation was done principally with wheel scrapers as the cut was shallow running from about 2 feet to 11 feet. The lower part of the excavation was removed by hand. All surplus material from this excavation was deposited along Dumesnil Street, thereby assisting very materially in bringing this unimproved street to the grade established by the city.

This sewer was completed April 5, 1912.

Jefferson Street Sewer.

The contract for this sewer and the work done under it was described in the Report of 1910. It was completed March 16, 1910.

Twenty-Eighth Street Sewer.

The contract for this sewer was signed by C. T. McCracken & Co., of Columbus, Ohio, April 4, 1911, the amount of the proposal being $3,510.43.

This contract included the construction of two combined sewers, both located in Twenty-eighth Street and discharging into the Northwestern Sewer at Cedar Street. One flows northward from Walnut Street to Cedar Street, a distance of 500 feet. This sewer is built of 24-inch vitrified pipe strengthened by a jacket of lean concrete. The other sewer flows southward from the alley midway between Market and Jefferson Streets to Cedar Street, a distance of 780 feet. The portion between Cedar and Jefferson Streets is 24-inch vitrified pipe incased in lean concrete and the portion north of Jefferson Street is 15-inch vitrified pipe.

The material excavated was yellow and blue clay and sand, varying in depth from 6 to 12 feet. All work was done by hand. At Cedar Street connection was made with an existing 12-inch drain and at Walnut Street existing catch-basins were connected with the sewer and leads laid for proposed catch-basins necessary to the proper drainage of this intersection.

All work was finished April 28, 1911, 35 days ahead of the time specified in the contract.

Cedar Street Sewer.

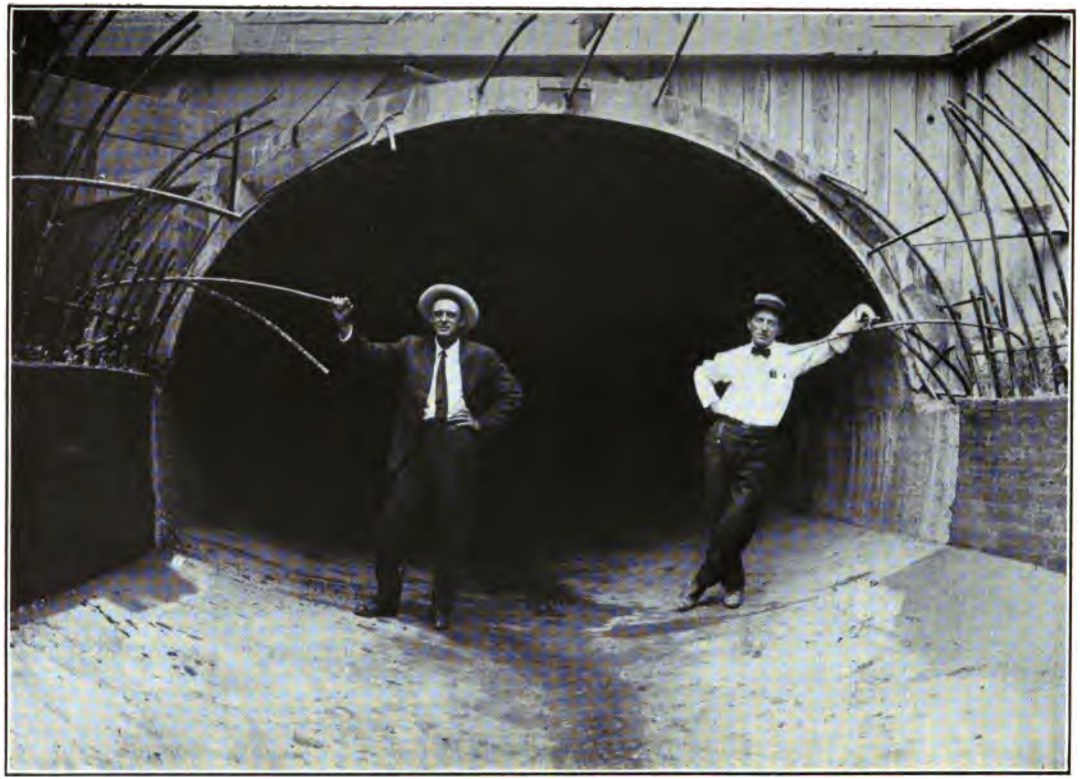
This contract was signed by C. T. McCracken & Co., of Columbus, Ohio, April 22, 1911, the amount of the proposal being $10,559.20.

This is a combined relief sewer replacing an old 42-inch circular brick sewer in Cedar Street between Nineteenth and Twentieth Streets. It is circular in shape, 60 inches in diameter and 727 feet in length.

From Nineteenth Street, where connection was made with the old 42-inch sewer in Cedar Street and a 22-inch pipe sewer in Nineteenth Street, the sewer runs westward in Cedar Street to Twentieth Street, at which point it discharges into the Northwestern Sewer. At this point also junction was made with a sewer 6 feet in diameter flowing from the north in Twentieth Street. The sewer was built of machine mixed Portland cement concrete. The junction chamber at Twentieth Street was reinforced with steel bars.

The excavation was done with a stiff-legged derrick and orange-peel bucket. The depth of cut was from 12 to 14 feet, the material excavated being yellow clay and sand. Near Twentieth Street a fire cistern which was found in the line of work was demolished and replaced with two fire hydrants.

An interesting feature was the construction of this sewer on the same location as the existing 42-inch brick sewer without the interruption of the flow of sewage. This was accomplished by laying a 15-inch pipe sewer below the grade and slightly in advance of the construction of the new sewer. This temporary sewer discharged into the Northwestern Sewer through the invert of the junction chamber at Twentieth Street. The old brick sewer was removed as the work progressed. In times of storm the 15-inch sewer



Section "B1" Northwestern sewer. Completed cross-section of sewer size 13 feet 6 inches by 9 feet.

was inadequate, so that the excess of sewage at such times overflowed into the trench and thence passed off through the newly constructed sewer. These conditions necessarily made progress slow; but favorable weather prevailed throughout the period of work and the contract was completed July 18, 1911, or 2 days ahead of the time required by the contract.

Thirty-Fourth Street Sewer.

The contract for this sewer was signed by C. T. McCracken & Co., of Columbus, Ohio, August 17, 1911. The amount of the proposal was $7,479.89.

This contract included the construction of a combined sewer 785 feet in length in Thirty-fourth Street, between Hanover and Cedar Streets, with a branch sewer in Herman Street west of Thirty-fourth Street, 230 feet in length, the system discharging into the Northwestern Sewer in Cedar Street.

The main sewer is circular in shape and 45 inches in diameter. It was built of plain Portland cement concrete. The excavation varied in depth from 8½ to 18 feet and consisted of yellow and blue clay and sand. The trench between Cedar and Herman Streets was excavated by hand and that between Herman and Hanover Streets with a stiff-legged derrick and orange-peel bucket.

The branch sewer is a 15-inch vitrified pipe. This excavation was done by hand, the material being yellow clay and sand. This trench averaged 10 feet in depth.

Work was finished October 2, 1911, 29 days in advance of the time required by the contract.

Third Street Sewer.

This contract was signed by James Ferry & Sons, of Pittsburg, Pa., April 27, 1910. The amount of the proposal was $44,251.

This contract included the construction of two sewers, both of which discharge into the Southern Outfall at Third Street and Avery Avenue.

The sewer draining the area north of Avery Avenue is circular, 51 inches in diameter, 1,452.4 feet long and extends as far north as A Street, where it connects with the old sewer in A Street. This sewer is constructed of reinforced concrete.

The sewer draining the area south of Avery Avenue is 3,321 feet long and extends southerly in Third Street to a point just north of K Street.

For a distance of 35.5 feet from the Southern Outfall this sewer is 20 inches in diameter, constructed of vitrified pipe incased in concrete. For a distance of 1,711.5 feet the sewer is 33. inches in diameter and is constructed of plain concrete. The next section, 900 feet in length and 24 inches in diameter, is also constructed of plain concrete. For a distance of 674 feet, or to the end of the work, the sewer is of vitrified pipe, 18 inches in diameter.

The excavation was through loam, sand, sandy gravel and clay. The depth north of Avery Avenue varied from 13.5 to 21.5 and averaged 17.5 feet. South of Avery Avenue the depth varied from 5.5 feet to 22 feet and averaged 11.3 feet. A Carson machine was used upon the excavation both north and south of Avery Avenue, between A Street and Brandeis Avenue. The remainder of the work was done by hand.

The average length of trench excavated to grade was 298.3 feet per week and the greatest length in one week was 997 feet. All concrete was mixed by hand, the sewer being constructed in two operations. The average length of concrete sewer constructed per week was 328 feet, while the greatest length constructed in any one week was 486.7 feet. The pipe sewer, 18 inches in diameter, 674 feet in length, was laid in two weeks.

The work done under this contract was completed October 1, 1910.

Fourth Street Sewer.

This contract was signed by C. T. McCracken & Co., of Columbus, Ohio, April 4, 1911. The amount of the proposal was $2,307.60.

This sewer is only 554 feet in length and is located in the east side of Fourth Street between Hill and A Streets. It is a combined sewer. Connections were made with existing catch-basins and one existing pipe sewer at Hill Street. This sewer empties into the old Dry Run Sewer at A Street and thence by way of the Third Street Sewer discharges into the Southern Outfall Sewer.

The sewer is built of vitrified pipe 24, 18 and 12 inches in diameter, including the connections at Hill Street. The 24-inch pipe is surrounded with lean concrete. A 12-inch water main at Hill Street, with crown grade at practically the same crown grade as the 24-inch sewer, necessitated a special construction of brick and reinforced concrete for the sewer beneath the water pipe. Excavation was in yellow clay of depth varying between 5 and 12 feet and was done by hand.

Work was completed April 25, 1911, 28 days before the date required by the contract.

Second Street Sewer.

This contract was signed February 8, 1911, by James Ferry & Sons of Pittsburg, Pa., the amount of the proposal being $31,161.30.

This sewer is located in the west side of Second Street between Avery and Burnett Avenues. It is a combined sewer connecting with existing sewers at Burnett Avenue, A and Lee Streets, and discharging into the Southern Outfall Sewer at Avery Avenue. The sewer is 2,430 feet in length and is circular in shape. Between Avery Avenue and A Streets it is 48 inches in diameter and from A Street to Burnett Avenue 42 inches in diameter. At Burnett Avenue the sewer reduces to 30 inches in diameter.

The excavation was in blue and yellow clay and sand, the depth of cut ranging from 11 to 23 feet. A Carson trench machine was used. Excepting for a short distance between Lee and A Streets, no water was encountered. A gas pipe which ran the entire length of the trench was removed and laid in the west sidewalk of Second Street by the Louisville

Gas Company. A fire cistern located in the line of the sewer, near Avery Avenue, was destroyed and replaced by two fire hydrants. Traffic on the south-bound street railway track was suspended during the progress of the work. At the crossing of the tracks of the L. & N. R. R., in A Street the Carson Machine was elevated sufficiently to allow free passage of trains and the work was prosecuted without mishap or serious interruption either to the train service or to the contractor.

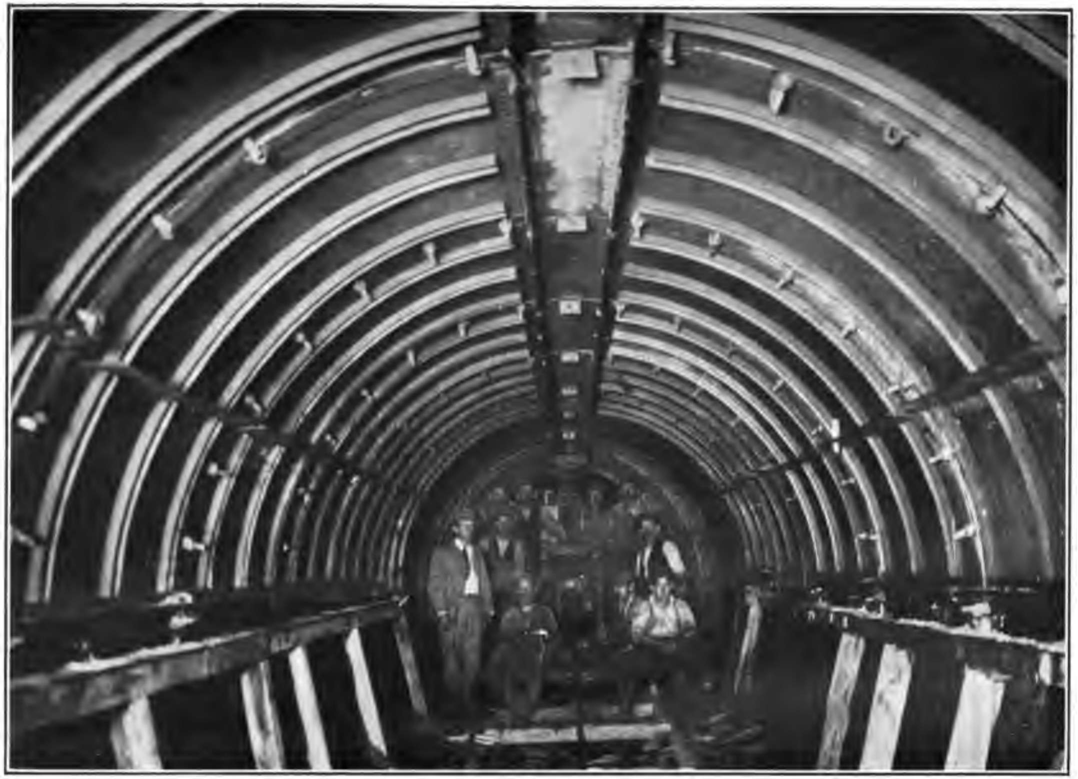
There were no special features in the construction of this sewer. Wooden centers were used and the sewer was built, in one operation, of plain Portland cement concrete, the concrete being mixed by hand. Work was completed July 18, 1911, 63 days in advance of the time required by the contract.

SECTION "B."—This section was built by day-labor under the direction of Mr. F. C. Williams, Resident Engineer, and A. L. Cowherd, Superintendent. The work was commenced February 12, 1912, and completed April 22, 1912, with the exception of the asphalt repaving which was postponed until the relaying of a gas pipe in the sewer trench by the Louisville Gas Co. was completed.

This sewer extends from Burnett Avenue to Magnolia Avenue, thence in Magnolia Avenue, from Second Street to the alley west of Second Street.

In Second Street it is of plain concrete 36 inches in diameter and in Magnolia Avenue of concrete 30 inches in diameter. A 20-inch pipe connection was made to the old sewer in Second Street at Magnolia Avenue, and at the alley west of Second Street an 18-inch pipe was laid northerly 50 feet from Magnolia Avenue, to allow the construction of additional catch-basins. Seven new catch-basins were built and five old ones connected to the new sewer.

The excavation, which was all done by hand, was yellow clay and sand and varied in depth from 6 to 10 feet. The concrete masonry, of which there were 184 cubic yards, was mixed by hand. During construction the street car traffic was confined to the track on the east side of the street, thus



Metal form used on Section "B2" Northwestern sewer. Completed cross-section of sewer 12 feet 9 inches by 9 feet.

facilitating the building of the sewer in the west shoulder. The gas main which was found in the trench was removed until the completion of the work.

Central Avenue Sewer.

SECTION "A."—In view of the saving affected by constructing Section "B" of the Oak Street Sewer by day-labor, the Chief Engineer recommended, and the Commission directed, that the sewer in Central Avenue, Section "A" be built by day-labor, primarily for the purpose of maintaining the day-labor organization so that it might be available for future work in case prices tendered appeared to be too high.

This sewer was built in Central Avenue between Fourth Street and the L. & N. Railroad, except 102 feet, which was built under Section "B" by E. A. Barker & Son. The sewer is 36 inches in diameter from Fourth to Jones Street, a distance of 608 feet, omitting the portion built under the contract for Section "B," and is constructed of plain concrete. From Jones Street to the L. & N. Railroad, a distance of 590 feet, the sewer is 22 inches in diameter and was constructed of vitrified pipe.

The excavation was in yellow clay and sand and averaged 11 feet in depth.

This work was done under the direction of Mr. F. C. Williams and completed March 4, 1911.

SECTION "B."—This contract was signed by E. A. Barker & Son, of Louisville, Ky., May 3, 1910.

This contract included the construction of two sewers—one in Central Avenue from the west to the east line of Third Street, 36 inches in diameter, 102 feet in length, and the other, a branch southwardly in Third Street from Central Avenue to the city limits, 1,041.5 feet long and 20 inches in diameter.

The excavation was in yellow and blue clay, varying in depth from 6.25 to 10.4 feet and averaging 7.7 feet. The excavation was done by hand. The average length of trench excavated to grade was 417 feet per week, the greatest length in any one week being 640 feet.

The sewer in Central Avenue was built of plain concrete, mixed by hand; the sewer in Third Street was built of vitrified pipe.

This contract was completed June 8, 1910.

Eighth and St. Catherine Streets Sewer.

Plans and specifications for the construction of this sewer by contract were prepared and bids were received. The lowest bid was $44,404.20. The engineer's estimate for the cost of this work was $34,359.16. As the prices submitted by the lowest bidder were considered too high, the Commission decided, upon written recommendation of the Chief Engineer, to proceed with this work by day-labor. Construction was begun on March 6, 1911, under the direction of Mr. F. C. Williams, Resident Engineer. The work was completed September 19, 1911, 197 days after commencement, the time fixed in the original contract specifications having been 210 days.

This work included the construction of a sewer starting at a junction chamber in the Oak Street Sewer near the west line of Eighth Street, and extending north in Eighth Street to St. Catherine Street, and thence easterly in St. Catherine Street to the west line of Third Street. In Eighth Street the sewer is 48 inches in diameter and has a length of 855 feet. From Eighth Street to Garvin Place in St. Catherine Street, a distance of 1,414 feet, the sewer is 42 inches in diameter. From Garvin Place to the end, a distance of 1,044 feet the sewer is 36 inches in diameter. The sewer was built of plain concrete which was placed in one operation. All forms were made of wood. The concrete was mixed by machine.

The excavation which was in sand clay and gravel varied in depth from 15 to 18 feet. A Carson machine was used in excavating the material. The average rate of progress was about one block per month.

On the completion of the work, accurate quantities of the various classes of work done were calculated with the following results:

Cost of work if it had been done by contract at prices of lowest bidder	$45,144 51
Actual cost of work	32,072 57
Saving resulting from doing the work by day-labor instead of by contract	$13,071 94

The saving amounts to 29 per cent. of the calculated cost of the work if it had been done by contract at the prices bid by the lowest bidder.

York Street Sewer.

Although it was known that the existing sewer in York Street was not of sufficient size theoretically to care for heavy storms in the district through which it passes, it was hoped that the relief given to this sewer by the construction of the sewer in Broadway from Sixth to Ninth Streets, and in Breckinridge Street from Sixth to Ninth Streets, together with the new outlet provided through the construction of the Twelfth Street Sewer, would be sufficient in all but very extreme storms. One or two very heavy rains occurring since the construction of these sewers have shown that further relief was necessary. It was also found that there was an overflow from the sewer in Fifth Street north of Chestnut Street backwards through the Fifth Street Sewer into the York Street Sewer, thereby contributing more storm water than it was able to carry. In order to provide further relief, the two sections of the York Street Sewer between Seventh and Sixth Streets, and Fifth and Fourth Streets were supplemented each with a new 30-inch concrete sewer. In Fourth Street an 18-inch vitrified pipe sewer was built southerly from York Street about 200 feet in order to intercept the water and prevent a large accumulation at the intersection of Fourth and York Streets.

This work was done under the direction of Mr. F. C. Williams, Resident Engineer, Mr. A. D. Campbell being Superintendent, the construction work running from October 23, 1911, to February 17, 1912. At Seventh Street a new junction chamber was constructed, at the easterly property line, within which the new sewer branched off from the old.

At Sixth Street, the sewer was connected with the existing sewer and the branch from the south was turned into the new structure. Between Fourth and Fifth Streets, the old sewer was 24 inches in diameter. The new 30-inch sewer intercepts the 24-inch sewer from the alley south of York Street between Fourth and Fifth Streets and intercepts a portion of the flow at Fourth and York Streets in addition to that taken by the Fourth Street branch before mentioned.

The excavated material consisted of a blue and yellow clay with a small amount of sand. It ranged in depth from 6 feet to 10 feet. The work of excavation and mixing of concrete was all done by hand.

At Fifth Street, two cast-iron pipes were found, one above the other, built through the sewer. In addition to this very serious obstruction, a considerable amount of sand, gravel and bricks was found in the sewer. This is an illustration of the condition that probably exists in many of the old sewers making it impossible for them to fulfill the duty expected of them.

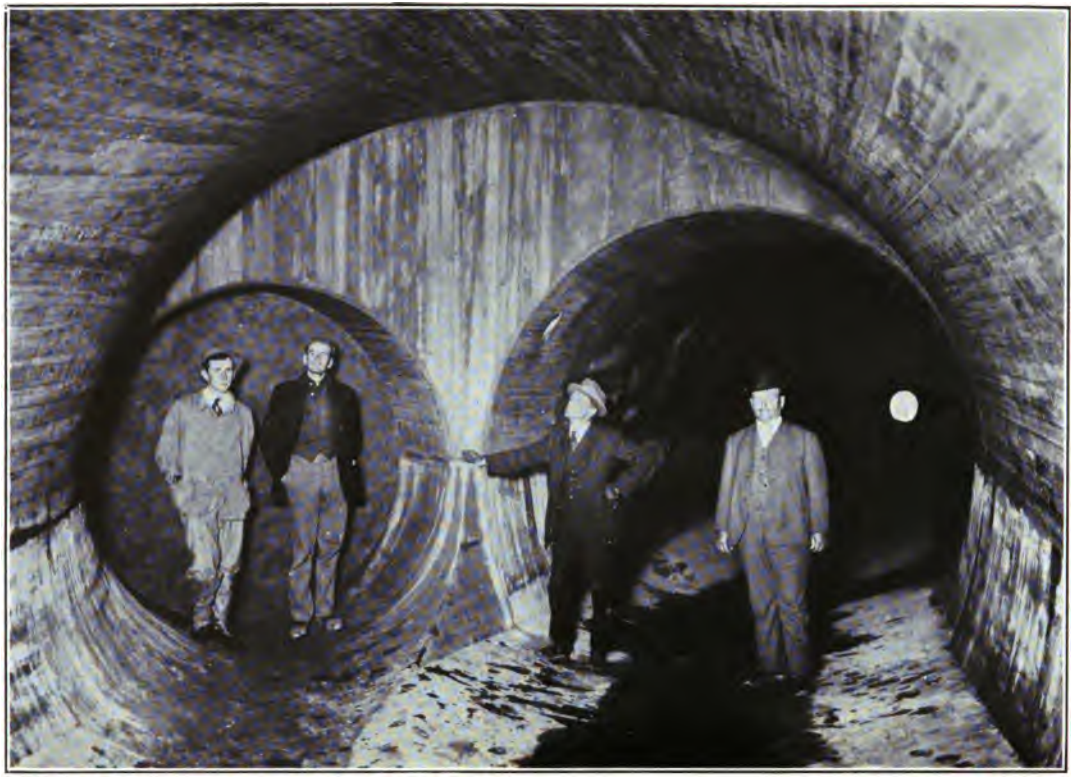
Ewing Avenue Sewer.

This work, which was fully described in the report of 1910, was completed by the Bankers Surety Co., of Cleveland, Ohio, surety for the contractor. The date of completion was June 3, 1910, several months after the time fixed in the contract.

Jane Street Sewer.

This contract was signed by C. T. McCracken & Co., of Columbus, Ohio January 25, 1910, the amount of the proposal being $30,113.40. The location of this sewer is as follows:

Starting at the lower end at the intersection of Edwards' Pond Branch and Jane Street; thence to the south in Jane Street for a distance of 500 feet; thence in private property on the west side of Jane Street to Sycamore Avenue at a point 120 feet west of Jane Street; thence in Sycamore Ave-



Junction Chamber Section "B2," Northwestern sewer, length 18 feet, greatest width, 16 feet.

nue to Jane Street; thence in Jane Street to Frankfort Avenue with a branch built eastwardly in the first alley south of Sycamore Avenue to Keats Avenue and from this point in Keats Avenue northwardly to the north end of Keats Avenue and southwardly to the right of way of the L. & N. R. R.

This contract included the construction of a storm drain and a sanitary sewer as this district is served by means of the separate system. The length of the drain is 3,405 feet and the sizes are 12 inches, 15 inches, 18 inches, 20 inches, 24 inches 27 inches and 33 inches in diameter. The sewer is 3,456 feet in length and is built of vitrified pipe, 8 inches, 10 inches and 12 inches in diameter, laid with sulphur-sand joints.

The materials encountered in excavation were yellow and red clay and rock, the cut varying from 4 feet to 17 feet. All work was done by hand except the rock drilling which was done by steam drills.

The 33-inch drain and a portion of the 24-inch drain were constructed of plain concrete. Blaw steel forms were used upon this work. The invert of the 33-inch drain was lined with vitrified brick because of the high velocity of flow which will obtain in time of storm. A portion of the 24-inch drain which was constructed on a steep slope was built of vitrified pipe surrounded with concrete.

This contract was completed August 24, 1910.

Frankfort Avenue Sewer.

SECTION "A."—The contract for this sewer was signed by James Ferry & Sons, of Pittsburgh, Pa., April 27, 1910, the amount of the proposal being $23,432.52. The location of this sewer and drain is as follows:

Starting in Frankfort Avenue at Jane Street and running westerly in Frankfort Avenue to the right of way of the L. & N. R. R. and easterly to a point near Raymond Avenue, and also from the Ewing Avenue Sewer and Drain in Frankfort Avenue about 100 feet west of Peterson Avenue, running west in Frankfort Avenue to Raymond Avenue.

This district is sewered by the separate system. The length of the drain is 2382 feet. The sizes are 12 inches, 15 inches, 18 inches and 24 inches in diameter. The drain which is 24 inches in diameter is constructed of plain concrete, that of the other sizes being constructed of vitrified pipe. The length of the sewer is 2,372 feet. It is constructed throughout of 8-inch vitrified pipe with sulphur-sand joints.

The excavation was in yellow and red clay and rock, the depth varying from 10½ feet to 18½ feet. All work was done by hand.

Double manholes were constructed upon this sewer and drain so that either conduit could be entered from one manhole. A partition wall was built to prevent storm water from flowing into the sewer.

Work upon this contract was completed September 10, 1910.

SECTION "B."—The contract for this sewer was signed by James Ferry & Sons, of Pittsburgh, Pa., October 31, 1910, the amount of the proposal being $18,787.70. The location of this sewer and drain is as follows.

Starting from the Ewing Avenue Sewer and Drain in Frankfort Avenue at Galt Avenue and running eastwardly in Frankfort Avenue to South Bayly Avenue, and also from the Aubin Avenue Sewer and Drain in Frankfort Avenue at South Bayly Avenue and running eastwardly in Frankfort Avenue to Kennedy Court.

This district is drained and sewered by means of the double system. The drain is 2,167 feet long. It is constructed of plain concrete 24 inches in diameter, and vitrified pipe 12 inches, 15 inches and 18 inches in diameter. The sewer also is 2,167 feet in length and is constructed of 8-inch vitrified pipe laid with sulphur-sand joints.

The excavation was through yellow and red clay and rock. The depth of cut varied from 9 feet to 11½ feet. All work was done by hand. Between Bayly Avenue and Kennedy Court the sewer location was very close to a 16-inch fuel gas main. The contractor in order to lessen the danger of settlement and consequent injury to this pipe constructed the sewer and drain in alternate sections of trench and tunnel. Opposite each joint of the gas main, for a length of 4 feet, the sewer and drain were laid in tunnel. Between these tunnel sections the sewer and drain were laid in a trench 8 feet in length. No apparent injury to the gas main developed during the construction of the sewer.

The required date of completion of this contract was February 28, 1911, and the work was completed January 9, 1911.

Long Avenue Sewer.

This contract was signed by Koppelman & Eady, of Louisville, July 15, 1911, the amount of the proposal being $18,892.57. The Long Avenue Sewer is a tributary of the Middle Fork Sewer, designed for house sewage only. It extends from the end of Section "C" Middle Fork Sewer just west of the intersection of Long and Raymond Avenues through private property north of Long Avenue to Peterson Avenue, there crossing into Long Avenue it continues in this street to Stilz Avenue. The sewer is 5,245 feet long of vitrified pipe and ranges in size from 22 inches to 10 inches in diameter, and was laid with sulphur-sand joints. The excavation was principally in yellow clay and rock. Although the depth of cut ranged from 4 feet to 18 feet, it was for the greater part of its length about 9 feet in depth. The combination of rock excavation with its necessary blasting and the presence of the large 48-inch distributing main of the Water Company in the same street caused this work to be somewhat hazardous. Fortunately, however, no damage was done to the water main and the sewer was built without unusual difficulty. This sewer was completed February 10, 1912.

Alta Avenue Sewer.

This contract was signed by Henry Bickel Company, of Louisville, on September 14, 1911, the amount of the proposal being $29,340.03. It embraced the construction of two conduits, the sanitary sewer and the storm-water drain being built side by side in the same trench. From a point in Alta Avenue about 600 feet east of Bardstown Road, the two conduits are built in alleys, northward 217 feet, eastward 195 feet and again northward 233 feet to Sherwood Avenue; thence eastward in Sherwood Avenue a distance of 254 feet, thence northward to Eastern Parkway in Cherokee Park; thence along the south side of Eastern Parkway to the circle and in a general northerly direction across the park roads to the head of Barringer Spring Branch. From this point the conduits follow the course of this branch through Cherokee Park to the tennis courts and thence due north to the west bank of the Middle Fork of Beargrass Creek at a point about 550 feet above Park Bridge No. 1, the total distance being 4,220 feet.

The sanitary sewer is of uniform size throughout, being a 10-inch vitrified pipe laid with sand and sulphur joints. It discharges into the upper end of Section "D" of the Middle Fork Sewer. The storm drain on the other hand is of various sizes including 20 and 22-inch vitrified pipe and circular concrete sections 24, 27, 33 and 36 inches in diameter. The storm-water drain discharges into the Middle Fork of Beargrass Creek at a point about 100 feet beyond the lower end of the work covered by this contract, this portion of the drain having been constructed by the day-labor force of the Commission.

The principal materials excavated were yellow and red clay and rock, though a small quantity of blue clay was removed. The depth of cut varied from 4 to 18 feet. All earth excavation was done with team scrapers or by hand. Where the excavation was in rock an air compressor was installed and air-drills used for drilling.

The only novel structural features in this contract were the manholes. The fact that the two conduits of the separate system were in close proximity in the same trench, and that they made many abrupt changes in alignment, necessarily complicated the design of the manholes at these points. Where feasible the manholes for the two conduits were entered by separate openings although they were built as one structure in the shape of a figure eight. Where this construction was impracticable combination manholes were built, one opening giving access to both the sewer and the drain, the two channels being separated by a partition wall.

Work was completed December 19 1911, 24 days in advance of the time required by the contract.

Barney Avenue Sewer.

This contract was signed March 20, 1912, by the H. H. Snyder Co., the amount of the proposal being $13,580.17. This sewer leaves the Alta Avenue Sewer in Cherokee Park near Beechwood Road and about opposite Barney Avenue, thence continues in the Park to the intersection of Cherokee Road and Barney Avenue. From this point it runs in Barney Avenue to Alta Avenue, thence in Alta Avenue to Everett Avenue, and thence in Everett Avenue to the center of Bonnycastle Avenue. This sewer was built at the urgent request of the Board of Public Works as sewerage was badly needed in this locality and as the Board was about to construct Alta Avenue.

The sewer consists of two lines, one for storm-water, varying in size from 22-inch vitrified pipe to 33-inch plain concrete, the other line for sanitary sewerage was of vitrified pipe, for a part of the way 10 inches and for the remainder 8 inches in diameter. The heaviest part of this work was in Alta Avenue where for a considerable distance there was a large amount of rock excavation, the depth of rock reaching a maximum of 13 feet and the total depth nearly 20 feet. The rock formation was peculiar although not unusual in some sections of the city, the higher portions being in the forms of pinnacles 4 feet or 5 feet in height, probably formed by the action of moving water at some remote period. In order to preserve the surface of Cherokee Road and not interfere with travel, the sewer was laid in tunnel at this point at the request of the Park Commission. The sewer and storm-water drain were laid about 2 feet apart on the center lines in the same trench, the sewer being lower to allow house connections being carried to it underneath the drain.

A large amount of this work at points where the excavation was comparatively shallow was done by hand. Wheel scrapers were used in the upper portion of the excavation outside of the park limit, and on the deep cut in Alta Avenue, a cableway was used. On the rock work, drilling was done with compressed air hammer drills, the power being received from a steam boiler and air compressor mounted on wheels. A 12-inch drain was extended to a depression at the intersection of Barney Avenue and Cherokee Road where a small pond was drained which had existed practically throughout the year.

This contract was completed July 17, 1912.

Castlewood Sewer.

SECTION "A."—The contract for this sewer was signed by the Henry Bickel Co., of Louisville, Ky., March 15, 1910, the amount of the proposal being $54,040.39. The location of this sewer may be described as follows:

Starting at the upper end of the Beargrass Intercepter, Section "F," in the property of St. Michael's Cemetery on the westerly bank of the South Fork of Beargrass Creek; thence following down the course of the creek for a distance of approximately 900 ft. in a northeasterly direction, crossing the creek and continuing to Castlewood Avenue; thence in Castlewood Avenue to Tyler Park; thence in Tyler Park under the Baxter Avenue arch bridge to Edenside Avenue at a point about 200 feet west of Quadrant Avenue; thence in Edenside Avenue to Quadrant Avenue.

This district is sewered by the combined system, a regulator being provided upon the sewer at a point near Beargrass Creek. From this regulator a vitrified pipe sewer 20 inches in diameter, laid with sulphur-sand joints, extends to the Beargrass Intercepter, a distance of 957 feet. Above the regulator the combined sewer is 3,591 feet in length, constructed of concrete and is 66 inches, 57 inches, 48 inches and 39 inches in diameter. The excavation was through yellow, red and blue clay and rock. Considerable water was encountered in the portion west of Beargrass Creek.

The earth excavation was done by teams and by hand. Steam drills were used on rock excavation. All concrete was mixed by hand.

The combined sewer was constructed of Portland cement concrete. The invert was lined throughout with vitrified brick, the two larger sizes being reinforced with steel bars. The concrete was placed in two operations, the invert being lined with brick, after which the wooden arch forms were set and the arch concrete poured.

At a point on the combined sewer about 40 feet east of its outlet into Beargrass Creek, a diversion dam and channel were constructed in the invert of the combined sewer by means of which the dry weather flow is diverted into the sanitary sewer connection, through which it passes to the Beargrass Intercepter. On the line of the sanitary sewer and about 15 feet from the point of diversion a regulating chamber was constructed and provided with a gate automatically operated by a float. This gate will be opened and closed as the water falls or rises in the Intercepter, thus regulating the quantity of sewage admitted to the intercepter from this sewer. The entire flow of sewage will be admitted to the Intercepter in dry weather and the regulator will come into use to prevent the admission of storm water during moderate or heavy rainfalls. Where the connection leading from the regulator to the intercepter passes under Beargrass Creek a cast iron pipe incased in concrete was substituted for the vitrified sewer pipe. The concrete was carried about 3 feet below the pipe to insure a stable foundation.

Work upon this contract was completed July 29, 1910.

A tide gate to prevent the inflow from the creek to the sewer was afterwards installed at the outlet of the combined sewer.

Improvement of the Channel of Beargrass Creek.

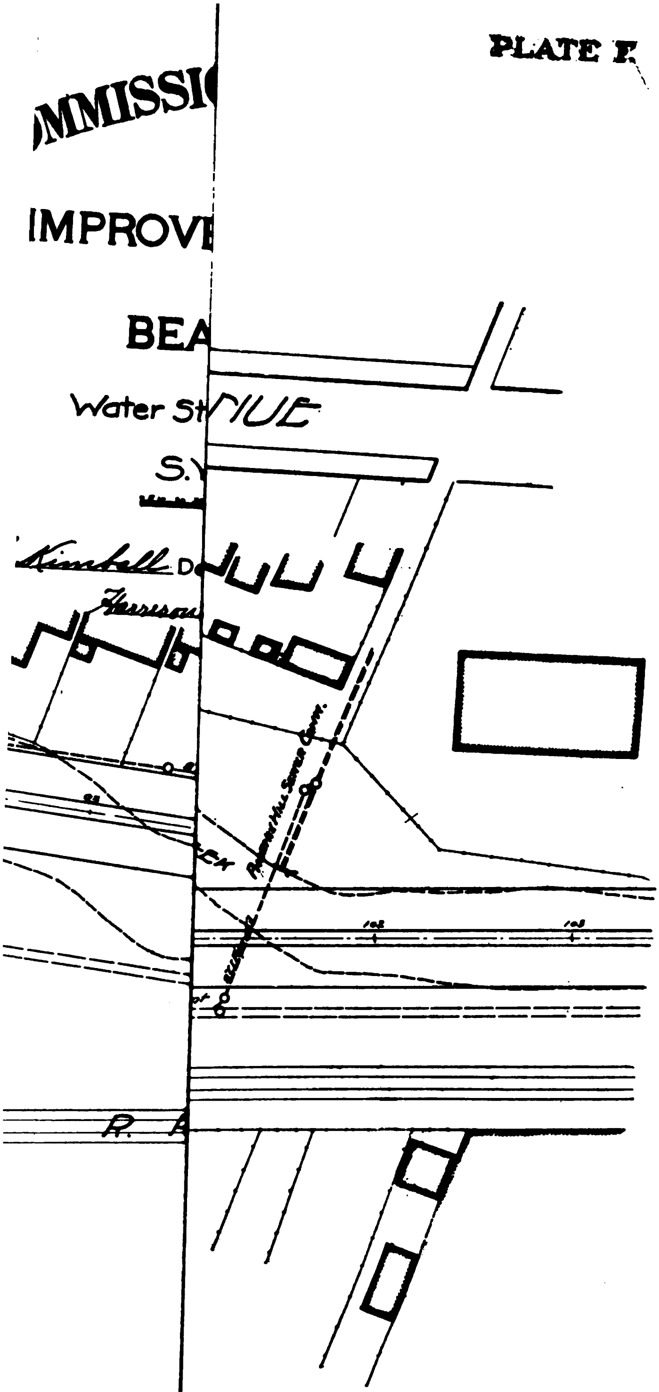
The channel of Beargrass Creek has been improved by widening and deepening and by the construction of a masonry floor and walls from the Water Street Branch of the L. & N. R. R. to the junction of the Middle and South Forks and also along the South Fork to about 400 feet southwest of Baxter Avenue. A portion of this work was constructed in connection with Section "C" of the Beargrass Intercepter, as described in the report of 1910. The remaining length was divided into four sections and was built by day-labor forces under the direction of Mr. F. C. Williams, Resident Engineer.

The Commission authorized the construction of Section "A" on August 15, 1911, Section "B" on February 2, 1912, Section "C" on April 12, 1912 and Section "D" on September, 4, 1912. A plan showing the new and old location of the creek, and plan showing the various cross-sections of the channel is shown elsewhere as Plates F and G.

SECTION "A" Comprised all the work upon the main stem of the creek and extended from the Water Street Branch Bridge to the Main Line Bridge of the L. & N. R. R. Between these bridges there are three others over the creek, the Main Street, the Big Four Connection and the Bourbon Stock Yard Bridges. The location of the creek channel was adapted to the lines of bridge abutments, with the exception of the Big Four Bridge, which had been built to conform to the proposed creek location. The L. & N. Main Line Bridge is a stone arch, the others are steel truss or girder bridges. The Bourbon Stock Yards Bridge is of two spans separated by a concrete masonry pier. The channel was widened at this point to offset the obstruction to the flow caused by the location of the pier within the channel. The southeasterly span was placed by the L. & N. R. R. Co. and the pier modified in shape by it to diminish the interference with the flow in the creek.

The width of the new channel is from 40 to 56 feet, the maximum being at the Stock Yards Bridge. The walls are

PLATE F



of plain concrete 4 feet high, except that approaching the abutments at the Water Street Branch, the Main Street and the L. & N. Main Line Bridges the walls were raised to a height of 9 feet. A dry weather channel 8 feet wide and 9 inches deep was built in the center of the channel and from its sides to the walls there is a rise in the floor of 3 inches.

Work on this section was commenced August 29, 1911, by E. J. Clerget, as Superintendent. On account of weather conditions, this work was suspended on January 20, 1912, and the force detailed to other work. On June 27th the work was resumed by G. S. Laubach, as Superintendent, and completed September 3d following. To facilitate the construction, a dam was built immediately above the L. & N. Main Line Bridge to divert the dry weather flow of both the Middle and South Forks through a 48-inch conduit to the Beargrass Intercepter. This conduit was originally designed as an emergency overflow from the Intercepter to the creek, to permit the Intercepter to be emptied for cleaning or repairs. The dam was built strong enough to hold only the flow from moderate rains so that it might collapse during a freshet and allow the flood to pass through without causing damage above. By means of this arrangement comparatively favorable conditions were obtained for the work. The dam was carried away on six different occasions during the period of construction of this section and minor repairs made necessary by storms at other times.

The excavation for this work was variable in depth, the greatest depth being at the sides of the channel and reached the maximum at the Bourbon Stock Yards Bridge. At several points depressions had been washed in the bed below the elevation of the new floor so that gravel refilling was required as a foundation. At the Water Street Branch Bridge much expense was incurred in the removal of the rock and cofferdam sheeting and piling left from the construction of the abutments to this bridge. This material had been a great obstruction to the creek flow in the past, occupying as it did about 4 feet in the bottom of the somewhat narrow passageway through the bridge. After this material was cleared away the foundation under the bridge was found to be to a large extent soft mud, requiring improvement before the masonry floor could be placed. A gravel foundation was considered sufficient for a portion, while for the remainder, particularly at the southwest corner, a plank platform 3 inches thick was used. At the Main Line Bridge the bed of the creek had been considerably scoured so that a fill of as much as 2 feet was necessary at some points. After these holes had been filled with sand and gravel and the masonry floor laid, not only was the creek channel improved, but the railroad bridge was protected from damage by further scouring or undermining.

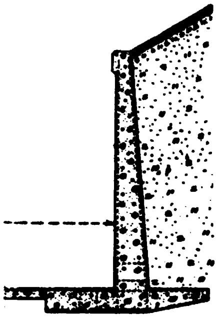
Eight hundred and ninety-four cubic yards of concrete were used upon this section, the mixing being done with a mechanical cubical mixer stationed on the Main Street Bridge. For the aggregate of this concrete broken limestone and river gravel were used and in the larger walls near the bridges larger pieces of stone were used to make a cyclopean concrete.

One fatal accident occurred in connection with this construction during a severe freshet in the latter part of December, when George W. Johnson, having volunteered as he was passing to assist a laborer who was clearing debris from the mouth of the 48-inch conduit, lost his footing and fell into the creek at this point and was drawn into the conduit.

SECTION "B" extends from the southeasterly face of the Main Line Bridge of the L. & N. R. R. to the northeasterly end of the masonry channel built in 1909 in connection with the contract for Section "C" Beargrass Intercepter.

Work on this section was commenced on February 24, 1912, under G. S. Laubach, Superintendent, and completed November 12th. In this work the channel has a uniform width of 50 feet and the walls are of reinforced concrete 9 feet high. The concrete floor 6 inches thick has a slope of 3 inches from the walls to the dry weather channel at the center, which is 8 feet wide and 9 inches deep. The dry weather channel and floor to the base of the wall on each side were of plain concrete. Within the limits of this section, the

PLATE G



SEWERAGE

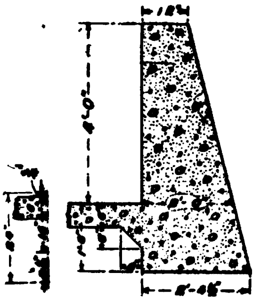
CHANNEL
CREEK
ING WALLS

ER.

NGINEER

CONSULTING ENGINEER

0 1 2 3FT.



4 FT. GRAVITY WALL

length of the creek was shortened from 1,000 feet to 777 feet.

In addition to the construction of the channel proper, the overflow from the Middle Fork siphon was extended to the wall and the emergency overflow from the Intercepter shortened, loose wooden gates being placed in the opening on the face of the new wall in each instance.

The excavation varied in depth from practically nothing to 15 feet. At the points of the greater depths, the natural earth was sloped backwards from the top of the 9-foot wall.

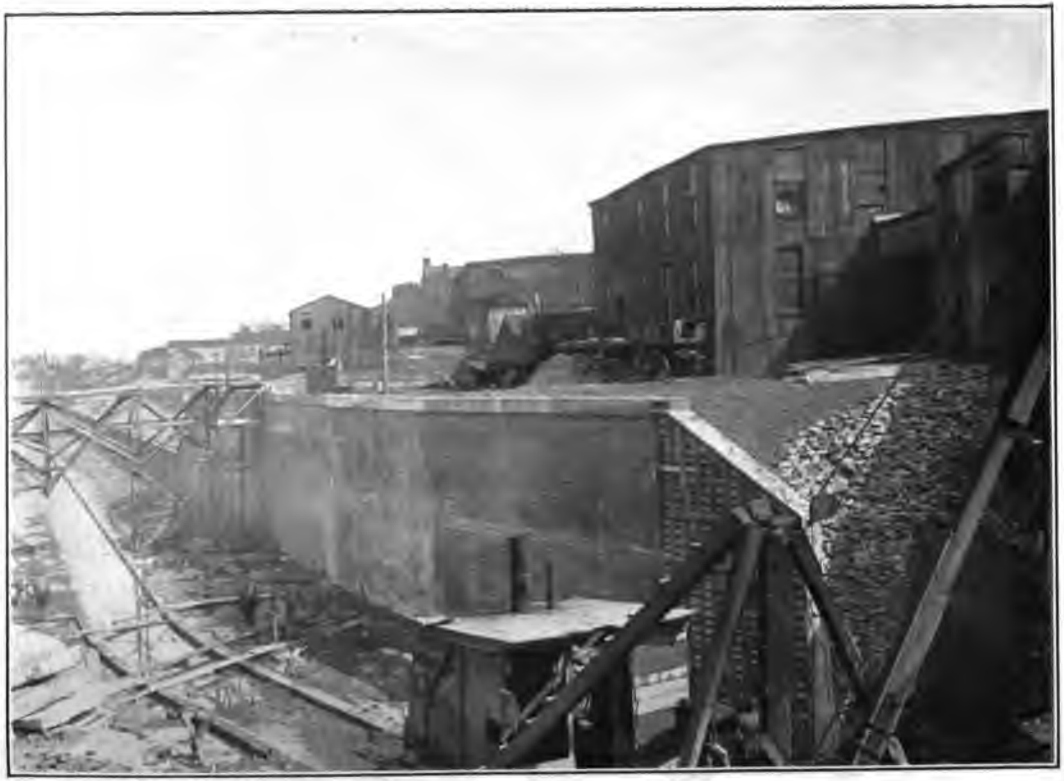
The great change in location between the new and old channels allowed the excavation for the new, for a considerable portion of its length, to be made while there was still a large flow in the creek from the spring rains. In March a contract for about 4,000 cubic yards of this excavation was awarded to J. H. Cahill. This amount was removed by him with wheel scrapers at the contract price of 24 cents a cubic yard. While this excavation was being done, the old channel was separated from the new by leaving a wall of natural earth, which was not cut through until after the masonry had been placed. The water in the two Forks of the creek was diverted into the intercepter during the construction of the channel for about 150 feet adjacent to the Main Line Bridge, after which the dam which had been originally placed for the work on Section "A" was removed and the water allowed to take its natural course. A small amount of rock excavation encountered at the southerly end of this section was removed by blasting, the drilling being done by hammer drills operated by steam. The concrete, amounting to 1,734 cubic yards, was mixed principally by a mechanical mixer.

SECTION "C" extends from the southwest end of the section built under the contract for Section "C" Beargrass Intercepter to Baxter Avenue. The work was commenced on June 11, 1912, by Mr. A. L. Cowherd, Superintendent. It is a little more than 600 feet long and is 50 feet in width, with the exception of the Baxter Avenue end where it narrows to the width of the Baxter Avenue bridge, which is 40 feet. This bridge built at right angles to the street instead of being built on the general line of the creek makes necessary, curves in the channel on both sides of the bridge, thereby causing some deflection in the course of the stream. The curves were designed to interfere as little as possible with the current, and observation of the flow during the freshet of March 26, 1913, showed the water flowing very easily through the new channel at this point. The creek line in this section is straightened by the re-location to the northwest at the lower end of about 20 feet and the re-location to the southeast at the center of 35 feet. The position of the creek found at the center was not its natural position but was that resulting from an encroachment by filling along the property on the southeasterly bank.

The northwesterly wall of the improved channel is of reinforced concrete 9 feet high for the entire length. On the southeasterly side the wall is 9 feet high with the exception of about 200 feet along the properties of Geiger, Fisk and Koop, Leo Messmer and Daniel Weiss. Here the wall is built to retain the earth at the elevation found when the work commenced. This is a reinforced concrete wall 24 feet high of the buttressed type. The base of the wall extends 9 feet back from the line of its face and is founded, as in fact most of the wall is on this section, upon natural rock.

Two existing sewers discharge storm water into the creek on this section, the Cooper Street Sewer on the southeasterly side and the Green Street Sewer on the northwesterly side. Each of these sewers is 36 inches in diameter and both were extended a distance of about 25 feet to the face of the new wall. On account of the steep grade, the inverts were lined with vitrified brick, the remaining masonry being plain concrete. An 8-inch sanitary sewer was built immediately back of the southeasterly wall for about three-fourths of its length. The floor and dry weather channel were identical in design with those on Section "B."

When the work started, a dam was built below the Green Street sewer in order to divert the flow in the creek through this sewer to the Beargrass Intercepter, thereby relieving the creek of this water which would otherwise interfere with



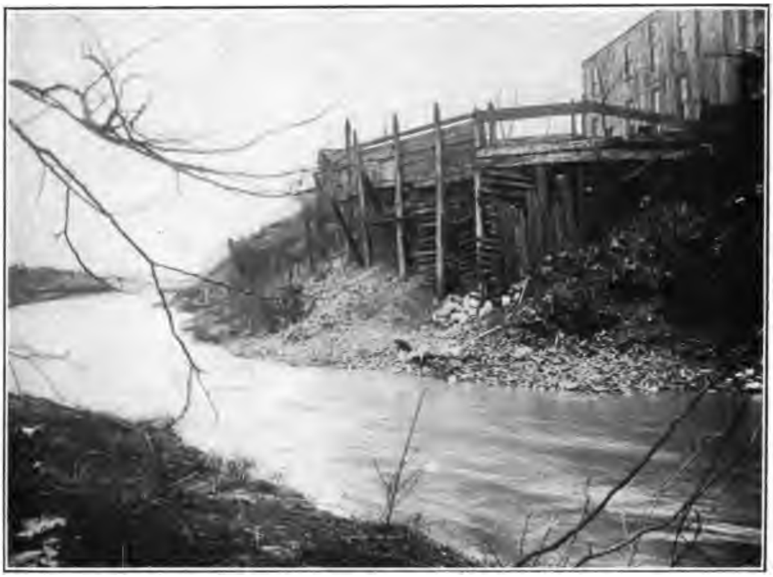
Improved Channel of Beargrass Creek. View of 24 foot wall immediately below Baxter Avenue Bridge.

the construction work. This method was found unsatisfactory owing to the difficulty of maintaining the dam and also to the fact that the pool caused by it became stagnant and somewhat offensive. In addition, this dam interfered with work upon Section "D" so that an opening was made into the Beargrass Intercepter at a point about 1,000 feet southwest of Baxter Avenue which allowed the flow of the creek to be diverted from its bed into the intercepter. The excavation in the bottom of the channel ranged from one or two feet to about six feet. The bed for nearly the whole length was rock overlaid with a small amount of earth. The excavation for the high wall was very expensive because it was nearly all of looose fill which could not be held in place. Heavy rains and particularly the flood in the river in January were the cause of a large amount of this trouble. The difficulty was also increased by the passage for a portion of the way of water from old and broken drain pipes through this material, rendering it very heavy and unstable. From the northeasterly end of the high wall to a point about 30 feet within the Weiss property no serious trouble was encountered with this excavation, the banks holding at a comparatively steep slope. When work had progressed to this point, a temporary injunction was filed against the Commission by Daniel Weiss, suspending the work within his property for about a week until the injunction was dissolved. On account of this delay, the first slides of a serious nature occurred. The flood during January delayed the work for four weeks but except for further slides in the Weiss property, causing additional excavation and refill, but little damage was sustained in addition to the overhead expenses running along during the delay.

The rock excavation on this section was very heavy, drilling and blasting at several places was necessary for a depth of from 6 to 7 feet. This rock was piled in the old bed of the creek on the bank at the northwesterly side and was placed in such a way as not to cause any pressure upon the new wall. A small amount of it was crushed for use in the concrete. It is a matter of congratulation that no accident of any account resulted from this work. No personal injuries except a few minor temporary ones were sustained by any of the employes, and none whatever by any bystander. The only injuries to property were caused by the slides before mentioned taking away the support of the corner of a rough frame building upon the Weiss property and the breaking by the blasting of a few panes of glass in the windows of the building upon the Pezold property fronting Baxter Avenue. The repairs to the glass in the latter were soon made at a slight expense but the replacement of the support to the Weiss building, which was originally a single post about 3 feet long, was not allowed. Work on a stone foundation for this support was commenced but was stopped by the owner when it had progressed only to a small extent. Great care was taken throughout the length to provide for the drainage of the walls, a drain being laid with outlets through the wall at its base to prevent the accumulation of water in the earth behind the walls, and selected material was used in the filling adjacent to the wall. On this section a stiff-leg derrick was used which handled nearly all of the excavation. The concrete masonry was mixed by hand on the northwesterly side and wheeled across to the easterly wall or to different parts of the channel as necessary.

The extraordinary storm of March 25th and 26th came at a time when this section was within a very few days of completion, all the masonry being in place with the exception of about 4 feet of wall on the southeasterly side and a small amount of floor. Extreme care was taken in the work, particularly the rock excavation in the immediate vicinity of the Baxter Avenue Bridge and the retaining wall in the Pezold property near Baxter Avenue. Relief holes were drilled at short intervals in the ledge along the line of the masonry of these structures to prevent the effect of the blasting reaching them.

SECTION "D" began at the northeasterly face of Baxter Avenue Bridge and from that point extended southwesterly. This work was commenced with G. S. Laubach, as Superintendent.



Beargrass Creek immediately below Baxter Avenue bridge before improvement. View of same property as shown in preceeding illustration.

The width of the channel conformed to the width of the bridge, 40 feet at the northeasterly end, and was enlarged to a width of 50 feet and carried that width as far as the channel was built. On this section a reinforced concrete wall 14 feet in height was adopted, the dry weather channel and floor being the same as in the previous sections. In this part of the work a radical change in the location of the creek was made. The old location was quite circuitous, making a detour to the east before reaching Baxter Avenue in its course from the south. The new line was as direct as possible from the existing bridge to the old location of the creek at a point about 500 feet southwest of Baxter Avenue. The distance between the centers of the old and new location was 110 feet. Although the adoption of this line necessitated excavation to the depth of nearly 25 feet, the lower two or three feet of this excavation was in rock and would have been necessary in either location, but the new line was shorter, thereby requiring less masonry. A more important consideration than this was the fact that it was the most favorable design for the flow. The circuitous route with its necessary curves not only offered resistance to the flow but also favored the deposit of sand and gravel brought down in time of a moderate storm. The 14 feet wall is of the cantilever type and is comparatively heavy, designed to retain an earth slope back of the wall. The earth excavation for this section, amounting to 15,300 cubic yards, was made under a contract with Henry Bickel Company. This material was excavated by steam shovels and removed by teams to the lowland on the southesterly side of the creek, a portion being carried to the lowland on the opposite side of Baxter Avenue. This excavation was done by this company between August 30th and November 6, 1912. The work of the day-labor force included the removal of all rock and some earth as well as the placing of all the masonry. It was commenced on October 23, 1912, and continued until March 25, 1913; when the work was shut down, as the funds available for the work had been exhausted.

The excavation of rock underneath the bridge was about 4 feet in depth. The center portion was blasted out carefully with light charges of dynamite. The rock at the abutments was cut off carefully with bull points to the required lines, blasting not being attempted close to the abutments. This work was also necessarily very carefully done by reason of the nature of the foundation of the bridge. Although on the southeasterly side the abutment rested upon the natural rock, for a considerable distance, on the northwesterly side it was apparently resting upon large stones deposited in the bed of the creek, care not having been taken to carry the bridge masonry down to bed rock which was but a short distance below. The old bridge masonry at this side was all carefully pointed up and the voids filled with concrete as the work progressed, not only to provide for the weight of the structure above but to secure it against erosion.

ACKNOWLEDGMENT.

In closing we desire to acknowledge the constant support and assistance of the Commissioners and the loyal and conscientious work of the Designing Engineer, Mr. J. H. Kimball, M. Am. Soc. C. E., and the Resident Engineers, Messrs. Frank C. Williams, Howard S. Morse, Assoc. M. Am. Soc. C. E., and Harrison P. Wires and their several assistants.

Respectfully submitted,
J. B. F. Breed, *Chief Engineer,*
Harrison P. Eddy, *Consulting Engineer.*

ORGANIZATION OF ENGINEERING DEPARTMENT.

LIST OF EMPLOYES SINCE JANUARY 1, 1910.

J. B. F. Breed	Chief Engineer.
H. P. Eddy	Consulting Engineer.
J. H. Kimball	Designing Engineer.
F. C. Williams	Resident Engineer, Southern Division.
H. S. Morse	Resident Engineer, Eastern Division.
H. P. Wires	Resident Engineer, Northwestern Division.
H. B. Allen	Chemist.

DRAFTSMEN.

W. M. Caye, also Inspector
G. V. Clow
E. C. Foust
W. H. Fox
R. D. French
Einar Thallaksen
E. J. Miner, also Inspector and Chief of Party.

CHIEFS OF PARTY.

J. A. Beck
R. H. Davy
R. W. Emerson
L. D. Lindsay
W. J. Lumbert
W. T. Newhall
L. J. Silberg, also Draftsman
W. H. Snyder
O. H. Starkweather, also Inspector
R. A. Strecker, also Inspector
F. C. Tolles
E. C. Willard
F. J. Van Hook, also Inspector.

OFFICE ASSISTANTS.

E. B. Abbett
E. H. Paul
W. H. Young.

INSPECTORS.

W. T. Blandford
A. H. Boerner
W. N. Bosler
G. F. Brockman
H. J. Burt
A. D. Campbell, also Supt. on Con'st.
A. G. C. Chapman
H. C. Clark
E. J. Clerget, also Supt. on Con'st.
A. H. Dodds
F. C. Dugan, also Draftsman
F. C. H. Eichorn
A. H. Fairleigh
S. H. Garvin, Jr.
G. F. Hardwick
J. F. Hardwick
W. L. Herald
H. B. Huffman
P. R. Kellar
G. S. Laubach, also Supt. on Con'st.
R. J. Misener
A. M. Pirtle
W. T. Randall
R. K. Scheffer
J. H. Turrell
J. B. Wathen
W. A. Weisenberger
E. D. Wetherton.

JUNIOR INSPECTORS.

W. C. Caye, Jr.
J. V. Conrad
Holton Cook
E. S. Graf
H. L. Harper
C. S. Kennedy
B. E. Rout
W. H. Rubel
E. F. Schimpeler
G. C. Stucky
A. S. Winston
M. R. Woodward.

INSTRUMENTMEN.

H. H. Brownell
W. H. Buchanan
P. H. Klosterman
L. H. Lanahan
Wm. Richards, Jr.
W. S. Roberts
M. B. Teeple
Wm. Wagner
Victor Von Borries.

RODMEN.

A. E. Allmond
W. B. Clark
Moorman Curtis
J. A. DeLeuil
J. A. Hill, Jr.
H. H. Ireland
G. H. Kendrick
H. J. Meiners
E. A. Mershon
O. L. Perrin
Lester Pyles
S. L. Rose
G. P. Schmidt
A. F. Schweers, also Draftsman
L. Schweers
H. A. Stockhoff
M. J. Warren
A. R. Weaver
W. H. Wilson
James Yunker

LABORATORY ASSISTANTS.

L. R. Carpenter
C. A. Hoefflin
F. X. Lawler.
B. W. Roth

BOOKKEEPERS.

L. I. Boone, Asst.
G. F. Von Roenn
C. S. A. Weber

SUPERINTENDENT

Sydney Smith.

Note.—No one remaining in the employ of the Commission less than three months is included in the above list.

APPENDICES

APPENDIX A.

SUMMARY OF BIDS FOR SEC. "A" CASTLEWOOD SEWER. CONTRACT NO. 61.

Opened March 4, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	C. T. McCracken & Co., Columbus, Ohio.	Paul & Kershner, Dayton, Ohio.
1a	Earth Excavation	957 lin. ft.	$ 4.00 3,828.00	$ 2.85 2,727.45	$ 4.00 3,828.00	$ 5.00 4,785.00
1b	Earth Excavation	2,003 lin. ft.	5.00 10,015.00	4.90 9,814.70	5.20 10,415.60	8.00 16,024.00
1c	Earth Excavation	1,588 lin. ft.	5.00 7,940.00	4.30 6,828.40	5.00 7,940.00	7.50 11,910.00
2a	Rock Excavation	1,470 cu. yds.	5.00 7,350.00	4.50 6,615.00	5.50 8,085.00	9.50 13,895.00
3a	Concrete Masonry	1,260 cu. yds.	10.50 13,230.00	11.50 14,490 00	11.00 13,860.00	12.50 15,750.00
3b	Concrete Masonry	30 cu. yds.	21.00 630.00	20.00 600.00	20.00 600.00	20.00 600.00
4	Brick paving	2,760 sq. yds.	2.00 5,520.00	3.20 8,832.00	2.80 7,728.00	3.00 8,280.00
5a	Plain steel	60,800 lbs.	.04	.03½	.03½	.04½
5b	Deformed steel	57,000 lbs.	Sq. lug, .04 2,280.00	.03½ 1,995.00	.03½ 1,995.00	.047 2,679.00
5c	Deformed steel	57,000 lbs.	Johnson Corrugated .04		.03½	.047
6	Excavation below Masonry...	20 cu. yds.	2.50 50.00	2.50 50.00	3.00 60.00	3.00 60.00
7	Gravel refill below Masonry..	20 cu. yds.	2.50 50.00	3.00 60.00	3.00 60.00	3.00 60.00
8	Vitrified pipe................	List price, $2,482.20	55% off 1,116.99	50% off 1,241.10	60% off 992.88	50% off 1,241.10
9	Pipe laying	951 lin. ft.	.40 380.40	.50 475.50	.40 380.40	1.00 951.00
11	8" Underdrain	4,000 lin. ft.	.35 1,400.00	.50 2,000.00	.40 1,600.00	1.00 4,000.00
15	Cleaning up	Lump sum	250.00	400.00	100.00	1,500.00
	Total....................	....	$54,040.39	$56,129.15	$57,644.88	$81,805.10

SEWER. CONTRACT NO. 62.—Opened April 8, 1910.

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	J. Connelly Const. Co., Cleveland, Ohio.	B. C. Milner Sons Co., Louisville, Ky.	Amer. Eng. & Const. Co., Chicago, Ill.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	960 lin. ft.	$ 9.00 8,640.00	$ 13.00 12,480.00	$ 22.00 21,120.00	$ 21.00 20,160.00	$ 33.00 31,680.00
1b	Earth Excavation	2,443 lin. ft.	7.10 17,345.30	13.00 31,759.00	17.60 42,996.80	20.00 48,860.00	26.00 63,518.00
1c	Earth Excavation	773 lin. ft.	7.45 5,758.85	11.00 8,503.00	13.75 10,628.75	19.00 14,687.00	23.00 17,779.00
1d	Earth Excavation	1,024 lin. ft.	6.00 6,144.00	11.00 11,264.00	13.50 13,824.00	18.00 18,432.00	22.00 22,528.00
1e	Earth Excavation	90 cu. yds.	2.00 180.00	1.50 135.00	2.00 180.00	4.00 360.00	3.00 270.00
2a	Rock Excavation	5 cu. yds.	8.00 40.00	6.00 30.00	6.00 30.00	10.00 50.00	10.00 50.00
3a	Concrete Masonry	4,960 cu. yds.	9.00 44,640.00	9.00 44,640.00	9.75 48,360.00	11.00 54,560.00	10.00 49,600.00
3b	Concrete Masonry	40 cu. yds.	20.00 800.00	22.00 880.00	10.00 400.00	20.00 800.00	20.00 800.00
4a	Brick Masonry	8 cu. yds.	15.00 120.00	15.00 120.00	10.00 80.00	10.00 80.00	20.00 160.00
4b	Vitrified brick paving........	70 sq. yds.	3.00 210.00	2.00 140.00	3.00 210.00	3.00 210.00	3.00 210.00
5a	Plain steel	512,000 lbs.	.035	.04	.035	.039	.0375
5b	Deformed steel	495,000 lbs.	Johnson Corrugated .035 17,325.00	Johnson, .04 19,800.00	Havemeyer, .035 17,325.00	Maxwell or Corr., .04	Sq. lug, .0375 18,562.50
5c	Deformed steel	495,000 lbs.	Gen. Fireproof or Havemeyer, .035	......	Sq. lug, .035	.0395 19,552.50	Corr., .0375
6	Excavation below Masonry..	50 cu. yds.	3.50 175.00	3.00 150.00	4.00 200.00	2.00 100.00	4.00 200.00
7	Gravel refill	50 cu. yds.	3.50 175.00	2.50 125.00	3.00 150.00	2.00 100.00	3.00 150.00
8	Vitrified pipe	List price, $1,220.45	50% off 610.22	50% off 610.23	50% off 610.23	60% off 488.18	50% off 610.23
9	Pipe laying	60 lin. ft.	.50 30.00	1.00 60.00	.75 45.00	1.00 60.00	1.00 60.00
11	8" Underdrain	1,000 lin. ft.	.20 200.00	.35 350.00	.50 500.00	.40 400.00	.50 500.00
15	Cleaning up	Lump sum	250.00	500.00	1,500.00	500.00	100.00
	Total.................	....	$102,643.37	$131,546.23	$158,159.78	$179,399.68	$206,777 73

SUMMARY OF BIDS FOR SEC. "A," FRANKFORT AVE. SEWER. CONTRACT NO. 63.

Opened April 1, 1910.

	ITEMS	QUANTITIES	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	1,017 lin. ft.	$ 6.90 7,017.30	$ 8.40 8,542.80	$ 9.90 10,068.30	$ 10.50 10,678.50
1b	Earth Excavation	955 lin. ft.	6.50 6,207.50	6.60 6,303.00	7.00 6,685.00	8.25 7,878.75
1c	Earth Excavation	365 lin. ft.	5.60 2,044.00	5.20 1,898.00	7.00 2,555.00	8.25 3,011.25
1d	Earth Excavation	38 lin. ft.	8.60 326.80	12.40 471.20	15.00 570.00	20.00 760.00
2a	Rock Excavation	420 cu. yds.	5.50 2,310.00	6.50 2,730.00	8.00 3,360.00	9.00 3,780.00
3a	Concrete Masonry	50 cu. yds.	12.00 600.00	16.00 800.00	15.00 750.00	21.00 1,050.00
3b	Concrete Masonry	5 cu. yds.	11.00 55.00	12.50 62.50	12.00 60.00	10.00 50.00
6	Excavation below Masonry.	10 cu. yds.	2.50 25.00	4.00 40.00	4.00 40.00	2.50 25.00
7	Gravel refill	10 cu. yds.	2.50 25.00	4.00 40.00	4.00 40.00	2.50 25.00
8	Vitrified pipe	List price, $4,793.15	55% off 2,156.92	50% off 2,396.58	60% off 1,917 26	55% off 2,156.92
9	Pipe laying	4,714 lin. ft.	.30 1,414.20	.22 1,037.08	.20 942.80	.50 2,357.00
11	8" Underdrain	2,377 lin. ft.	.40 950.80	.45 1,069.65	.10 237.70	.35 831.95
15	Cleaning up	Lump sum	300.00	300.00	300.00	100.00
	Total................	....	$23,432.52	$25,690.81	$27,526.06	$32,704.37

SUMMARY OF BIDS FOR THIRD STREET SEWER. CONTRACT NO. 64.

Opened April 1, 1910.

	ITEMS	QUANTITIES	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co., Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation	1,447 lin. ft.	$ 8.85 12,805.95	$ 11.25 16,278.75	$ 15.00 21,705.00	$ 16.10 23,296.70
1b	Earth Excavation	1,745 lin. ft.	6.20 10,819.00	8.60 15,007.00	12.00 20,940.00	11.00 19,195.00
1c	Earth Excavation	1,370 lin. ft.	4.25 5,822.50	3.80 5,206.00	6.75 9,247.50	10.00 13,700.00
1d	Earth Excavation, Branch Sewers..................	70 lin. ft.	7.00 490.00	2.75 192.50	20.00 1,400.00	18.00 1,260.00
3a	Concrete Masonry	575 cu yds.	10.50 6,037.50	12.50 7,187.50	10.50 6,037.50	11.00 6,325.00
3b	Concrete Masonry	450 cu. yds.	12.00 5,400.00	12.50 5,625.00	11.75 5,287.50	13.00 5,850.00
5a	Plain steel	21,900 lbs.	.04	.04	.04	.04
5b	Deformed steel	20,500 lbs.	Sq. lug, .04 820.00	Lug Bars .04 820.00	Sq. lug, .04 820.00	Sq. lug, .04 820.00
5c	Deformed steel	20,500 lbs.	......	Slant Rib, .04	....	Johnson Corr., .04
6	Excavation below Masonry..	20 cu. yds.	2.50 50.00	3.00 60.00	2.50 50.00	3.00 60.00
7	Gravel refill	20 cu. yds.	2.50 50.00	3.00 60.00	2.50 50.00	3.00 60.00
8	Vitrified pipe	List price, $1,800.10	50% off 900.05	50% off 900.05	50% off 900.05	50% off 900.05
9	Pipe laying	765 lin. ft.	.40 306.00	.22 168.30	.50 382.50	.25 191.25
11	8" Underdrain	1,000 lin. ft.	.35 350.00	.35 350.00	.35 350.00	.35 350.00
15	Cleaning up	Lump sum	400.00	500.00	100.00	1,000.00
	Total.................	....	$44,251.00	$52,355.10	$67,270.05	$73,008.00

SUMMARY OF BIDS FOR FIFTEENTH AND TWENTY-THIRD STS. SEWERS. CONTRACT NO. 65.

Opened April 15, 1910.

	ITEMS	QUANTITIES	B. C. Milner Sons Co., Louisville, Ky.	Guild & Co., Chattanooga, Tenn.	* Jas. Ferry & Sons, Pittsburgh, Pa.	Henry Bickel Co., Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation	456 lin. ft.	$ 10.50 4,788.00	$ 12.40 5,654.40	$ 16.75 7,638.00	$ 15.00 6,840.00	$ 19.20 8,755.20
1b	Earth Excavation	593 lin. ft.	9.85 5,841.05	14.88 8,823.84	15.50 9,191.50	16.00 9,488.00	14.75 8,746.75
3a	Concrete Masonry	445 cu. yds.	9.65 4,294.25	12.50 5,562.50	11.00 4,895.00	15.00 6,675.00	15.00 6,675.00
4	Brick paving	27 sq. yds.	3.00 81.00	3.00 81.00	3.50 94.50	4.00 108.00	3.10 83.70
6	Excavation below Masonry..	10 cu. yds.	3.00 30.00	2.50 25.00	3.00 30.00	3.00 30.00	3.00 30.00
7	Gravel refill	10 cu. yds.	2.00 20.00	2.50 25.00	3.00 30.00	3.00 30.00	3.00 30.00
8	Vitrified pipe	List price, $454.00	50% off 227.00	50% off 227.00	50% off 227.00	50% off 227.00	50% off 227.00
11	8″ Underdrain	1,049 lin. ft.	.35 367.15	.35 367.15	.35 367.15	.35 367.15	.35 367.15
15	Cleaning up	Lump sum	350.00	250.00	400.00	100.00	300.00
	Total.................	....	$15,998.45	$21,015.89	$22,873.15	$23,865.15	$25,214.80

*Informal Bid.

SUMMARY OF BIDS FOR SEVENTH AND HILL STS. SEWER. CONTRACT NO. 66.

Bids Opened April 29, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	W. A. Fitch, Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation	332 lin. ft.	$ 13.25 4,399.00	$ 14.00 4,648.00	$ 19.00 6,308.00	$ 18.50 6,142.00	$ 18.00 5,976.00
1b	Earth Excavation	674 lin. ft.	10.00 6,740.00	8.50 5,729.00	10.20 6,874.80	11.75 7,919.50	11.50 7,751.00
1c	Earth Excavation	1,150 lin. ft.	6.00 6,900.00	6.60 7,590.00	6.50 7,475.00	10.50 12,075.00	13.00 14,950.00
1d	Earth Excavation	260 lin. ft.	2.70 702.00	3.50 910.00	2.80 728.00	3.50 910.00	4.00 1,040.00
3a	Concrete Masonry	445 cu. yds.	12.00 5,340.00	14.75 6,563.75	13.40 5,963.00	12.00 5,340.00	13.00 5,785.00
4a	Brick paving (Vitrified).....	5 sq. yds.	5.00 25.00	3.00 15.00	2.50 12.50	4.00 20.00	4.00 20.00
4b	Brick Masonry	10 cu. yds.	12.00 120.00	14.75 147.50	14.00 140.00	20.00 200.00	15.00 150.00
6	Excavation below Masonry..	10 cu. yds.	3.00 30.00	3.50 35.00	3.00 30.00	3.50 35.00	3.00 30.00
7	Gravel refill	10 cu. yds.	3.00 30.00	2.50 25.00	3.00 30.00	3.50 35.00	3.00 30.00
8	Vitrified pipe	List price, $949.65	50% off 474.83	50% off 474.83	50% off 474.83	50% off 474.83	50% off 474.83
9	Pipe laying	299 lin. ft.	1.00 299.00	.50 149.50	.32 95.68	.50 149.50	.50 149.50
15	Cleaning up	Lump sum	500.00	500.00	200.00	500.00	1,500.00
	Total..................	....	$25,559.83	$26,787.58	$28,331.81	$33,800.83	$37,856.33

SUMMARY OF BIDS FOR SEC. "B," MIDDLE FORK SEWER. CONTRACT NO. 67.

Bids opened April 29, 1910.

	ITEMS	QUANTITIES	A. F. Helm, Cleveland, Ohio.	Guild & Co., Chattanooga, Tenn.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	960 lin. ft.	$ 7.00	$ 8.75	$ 6.50
			6,720.00	8,400.00	6,240.00
1b	Earth Excavation	2,000 lin. ft.	4.45	4.25	6.50
			8,900.00	8,500.00	13,000.00
2a	Rock Excavation	50 cu. yds.	5.00	7.00	6.50
			250.00	350.00	325.00
3a	Concrete Masonry, "A"	345 cu. yds.	13.00	14.00	12.00
			4,485.00	4,830.00	4,140.00
3b	Concrete Masonry, "B"	340 cu. yds.	13.00	15.00	13.50
			4,420.00	5,100.00	4,590.00
3c	Concrete Masonry, "B"	125 cu. yds.	15.00	18.00	18.00
			1,875.00	2,250.00	2,250.00
5a	Steel Reinforcing (Plain)	235 lbs.	.05	.04	.05
5b	Steel Reinforcing (Deformed)	220 lbs.	.05	Johnson, .04	Sq. lug, .05
			11.00	8.80	11.00
6	Excavation below Masonry	50 cu. yds.	1.50	3.00	4.00
			75.00	150.00	200.00
7	Gravel refill	50 cu. yds.	2.50	3.00	3.00
			125.00	150.00	150.00
8	Vitrified pipe	List price,	56% off	50% off	50% off
		$1,182.50	520.30	591.25	591.25
9	Pipe laying	329 lin. ft.	.50	1.00	1.00
			164.50	329.00	329.00
11	8″ Underdrain	2,960 lin. ft.	.35	.40	.35
			1,036.00	1,184.00	1,036.00
12	Timber foundation	21,000 ft. B. M.	18.00	40.00	50.00
			378.00	840.00	1,050.00
15	Cleaning up	Lump sum	300.00	500.00	150.00
	Total		$29,259.80	$33,183.05	$34,062.25

SUMMARY OF BIDS FOR SEC. "B," CENTRAL AVENUE SEWER. CONTRACT NO. 68.

Bids opened April 22, 1910.

	ITEMS	QUANTITIES	E. A. Barker & Son Louisville, Ky.	Gray Const. Co., Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	R. L. Clark, Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	W. A. Fitch & Co., Louisville, Ky.
1a	Earth Excavation.	1,040 lin. ft.	$ 1.85 1,924.00	$ 2.35 2,444.00	$ 1.70 1,768.00	$ 2.50 2,600.00	$ 2.43 2,527.20	$ 2.75 2,860.00	$ 5.00 5,200.00
1b	Earth Excavation.	102 lin. ft.	4.00 408.00	3.10 316.20	6.25 637.50	5.00 510.00	5.50 561.00	6.00 612.00	8.50 867.00
3a	Concrete Masonry	40 cu. yds.	9.00 360.00	11.00 440.00	15.00 600.00	15.00 600.00	25.00 1,000.00	16.00 640.00	14.75 590.00
6	Excavation below Masonry	25 cu. yds.	2.00 50.00	2.00 50.00	3.00 75.00	2.50 62.50	1.00 25.00	2.50 62.50	4.50 112.50
7	Gravel refill.....	25 cu. yds.	2.00 50.00	2.25 56.25	3.00 75.00	3.00 75.00	2.00 50.00	2.00 50.00	2.50 62.50
8	Vitrified pipe....	List price, $2,395.30	65% off 838.36	60% off 958.12	55% off 1,077.89	65% off 838.36	50% off 1,197.65	55% off 1,077.89	50% off 1,197.65
9	Pipe laying......	1,042 lin. ft.	.22 229.24	.24 250.08	.28 291.76	.20 208.40	.25 260.50	.50 521.00	.65 677.30
11	8" Underdrain...	1,142 lin. ft.	.35 399.70	.35 399.70	.35 399.70	.35 399.70	.35 399.70	.35 399.70	.35 399.70
15	Cleaning up......	Lump sum	25.00	100.00	200.00	50.00	200.00	50.00	500.00
	Total.....	....	$4,284.30	$5,014.35	$5,124.85	$5,343.96	$6,221.05	$6,273.09	$9,606.65

SUMMARY OF BIDS FOR SEC. "C," NORTHEASTERN SANITARY TRUNK SEWER. CONTRACT NO. 69.

Bids opened June 10, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Duff Const. Co. Cleveland, Ohio.	B. C. Milner Sons Co., Louisville, Ky.	Helm & Henderson Cleveland, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.	Amer. Eng. & Const. Co., Chicago, Ill.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation and refill.......	1,272 lin. ft.	$ 2.00 2,544.00	$ 4.25 5,406.00	$ 3.75 4,770.00	$ 3.77 4,795.44	$ 3.35 4,261.20	$ 4.75 6,042.00	$ 2.50 3,180.00
1b	Earth Excavation and refill.......	1,675 lin. ft.	2.00 3,350.00	3.25 5,443.75	4.00 6,700.00	3.20 5,360.00	3.90 6,532.50	4.75 7,956.25	4.00 6,700.00
1c	Earth Excavation and refill.......	332 lin. ft.	2.00 664.00	3.75 1,245.00	3.35 1,112.20	3.10 1,029.20	3.00 996.00	6.00 1,992.00	3.00 996.00
1d	Earth Ex. and refill (Br. Sewers)	20 lin. ft.	3.00 60.00	2.25 45.00	3.60 72.00	2.00 40.00	10.00 200.00	5.00 100.00	6.00 120.00
2a	Rock Excavation.	1,200 cu. yds.	5.00 6,000.00	5.00 6,000.00	6.50 7,800.00	7.48 8,976.00	8.50 10,200.00	6.00 7,200.00	8.00 9,600.00
3a	Concrete Masonry	270 cu. yds.	15.00 4,050.00	15.00 4,050.00	14.00 3,780.00	19.50 5,265.00	17.50 4,725.00	15.00 4,050.00	18.00 4,860.00
6	Exc. below Masonry	10 cu. yds.	2.00 20.00	1.50 15.00	4.00 40.00	2.00 20.00	3.50 35.00	2.00 20.00	4.00 40.00
7	Gravel refill below Masonry...	10 cu. yds.	2.00 20.00	2.00 20.00	2.50 25.00	2.40 24.00	3.50 35.00	2.50 25.00	4.00 40.00
8	Vitrified pipe....	List price, $3,139.33	60% off 1,255.73	55% off 1,412.70	50% off 1,569.67	54% off 1,444.09	50% off 1,569.67	65% off 1,098.77	55% off 1,412.70
9	Pipe laying	1,468 lin. ft.	.50 734.00	.25 367.00	.50 734.00	.40 587.20	.65 954.20	.30 440.40	1.00 1,468.00
11	6" Underdrain...	3,299 lin. ft.	.25 824.75	.35 1,154.65	.40 1,319.60	.50 1,649.50	.20 659.80	.35 1,154.65	.80 2,639.20
15	Cleaning up.....	Lump sum	50.00	150.00	500.00	300.00	500.00	750.00	500.00
	Total.....	....	$19,572.48	$25,309.10	$28,422.47	$29,490.43	$30,668.37	$30,829.07	$31,555.90

SUMMARY OF BIDS FOR SEC. "D," NORTHEASTERN SANITARY TRUNK SEWER. CONTRACT NO. 70.

Bids opened June 10, 1910.

	ITEMS	QUANTITIES	Frank Schefold, New Albany, Ind.	Gray Const. Co., Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	Jas. Duff Const. Co., Cleveland, Ohio.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation and refill..	3,139 lin. ft.	$ 0.65 2,040.35	$ 1.40 4,394.60	$ 1.50 4,708.50	$ 2.60 8,161.40	$ 1.85 5,807.15
1d	Earth Excavation and refill, Branch Sewers............	230 lin. ft.	.50 115.00	2.00 460.00	5.00 1,150.00	2.60 598.00	2.00 460.00
2a	Rock Excavation............	700 cu. yds.	5.00 3,500.00	6.00 4,200.00	5.00 3,500.00	4.00 2,800.00	6.75 4,725.00
3a	Concrete Masonry...........	20 cu. yds.	9.00 180.00	12.00 240.00	20.00 400.00	12.00 240.00	20.00 400.00
6	Excavation below Masonry..	10 cu. yds.	1.00 10.00	2.00 20.00	2.00 20.00	1.50 15.00	5.00 50.00
7	Gravel refill below Masonry..	10 cu. yds.	2.00 20.00	2.50 25.00	2.00 20.00	2.00 20.00	5.00 50.00
8	Vitrified pipe................	List price, $6,768.56	68% off 2,165.94	65% off 2,369.00	55% off 3,045.85	55% off 3,045.85	56% off 2,978.17
9	Pipe laying.................	3,369 lin. ft.	.25 842.25	.30 1,010.70	.40 1,347.60	.25 842.25	.42 1,414.98
11	6" Underdrain...............	3,369 lin. ft.	.25 842.25	.50 1,684.50	.25 842.25	.35 1,179.15	.40 1,347.60
15	Cleaning up.................	Lump sum	150.00	200.00	200.00	50.00	500.00
	Total....................	....	$9,865.79	$14,603.80	$15,234.20	$16,951.65	$17,732.90

SUMMARY OF BIDS FOR SEC. "D," NORTHEASTERN SANITARY TRUNK SEWER. CONTRACT NO. 70.

(Continued.)

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	E. A. Barker & Son Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	B. C. Milner Sons Co., Louisville, Ky.	Helm & Henderson Cleveland, Ohio.	Amer. Eng. & Const. Co., Chicago, Ill.
1a	Earth Excavation and refill..	3,139 lin. ft.	$ 1.90 5,964.10	$ 2.50 7,847.50	$ 2.90 9,103.10	$ 3.25 10,201.75	$ 3.96 12,430.44	$ 4.75 14,910.25
1d	Earth Excavation and refill, Branch Sewers............	230 lin. ft.	2.25 517.50	2.00 460.00	2.50 575.00	2.50 575.00	2.00 460.00	5.00 1,150.00
2a	Rock Excavation............	700 cu. yds.	7.00 4,900.00	7.00 4,900.00	7.00 4,900.00	6.00 4,200.00	6.90 4,830.00	6.50 4,550.00
3a	Concrete Masonry...........	20 cu. yds.	20.00 400.00	20.00 400.00	18.00 360.00	14.00 280.00	26.00 520.00	20.00 400.00
6	Excavation below Masonry..	10 cu. yds.	3.00 30.00	3.00 30.00	3.50 35.00	4.00 40.00	2.00 20.00	2.50 25.00
7	Gravel refill below Masonry..	10 cu. yds.	4.00 40.00	3.00 30.00	3.50 35.00	2.50 25.00	2.50 25.00	2.00 20.00
8	Vitrified pipe...............	List price, $6,768.56	60% off 2,707.42	60% off 2,707.43	50% off 3,384.28	50% off 3,384.28	60% off 2,707.42	65% off 2,369.00
9	Pipe laying.................	3,369 lin. ft.	1.00 3,369.00	.50 1,684.50	.50 1,684.50	.50 1,684.50	.75 2,526.75	.30 1,010.70
11	6" Underdrain...............	3,369 lin. ft.	.20 673.80	.20 673.80	.20 673.80	.30 1,010.70	.60 2,021.40	.35 1,179.15
15	Cleaning up................	Lump sum	200.00	100.00	500.00	500.00	94.00	500.00
	Total....................	....	$18,801.82	$18,833.23	$21,250.68	$21,901.23	$25,635.01	$26,114.10

SUMMARY OF BIDS FOR SEC. "B," OAK ST. SEWER. CONTRACT NO. 71.

Opened July 8, 1910.

	ITEMS	QUANTITIES	Helm & Henderson Cleveland, Ohio.	Guild & Co., Chattanooga, Tenn	Amer. Eng. & Const. Co., Chicago, Ill.	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co. Louisville, Ky.
1a	Earth Excavation	923 lin. ft.	$ 9.80 9,045.40	$ 9.00 8,307.00	$ 8.00 7,384.00	$ 10.50 9,691.50	$ 10.95 10,106.85	$ 11.00 10,153.00
1b	Earth Excavation	626 lin. ft.	8.95 5,602.70	8.75 5,477.50	11.00 6,886.00	8.90 5,571.40	6.75 4,225.50	8.60 5,383.60
1c	Earth Excavation	1,000 lin. ft.	9.25 9,250.00	11.00 11,000.00	10.40 10,400.00	12.10 12,100.00	12.50 12,500.00	10.60 10,600.00
1d	Earth Excavation (Branch Sewers)	25 lin. ft.	3.00 75.00	5.00 125.00	12.00 300.00	10.00 250.00	7.00 175.00	8.50 212.50
3a	Concrete Masonry, "A"......	680 cu. yds.	13.15 8,942.00	11.50 7,820.00	15.00 10,200.00	10.75 7,310.00	12.00 8,160.00	13.00 8,840.00
3b	Concrete Masonry, "B"......	90 cu. yds.	11.00 990.00	14.00 1,260.00	10.00 900.00	8.00 720.00	10.00 900.00	15.00 1,350.00
3c	Concrete Masonry, "A" in Junction Chamber.........	8 cu. yds.	30.00 240.00	30.00 240.00	20.00 160.00	20.00 160.00	25.00 200.00	20.00 160.00
6	Excavation below Masonry...	10 cu. yds.	2.00 20.00	3.00 30.00	2.00 20.00	2.50 25.00	3.00 30.00	3.00 30.00
7	Gravel refill	10 cu. yds.	2.00 20.00	3.00 30.00	2.00 20.00	2.50 25.00	3.00 30.00	3.00 30.00
8	Vitrified pipe................	List price, $3,765.40	60% off 1,506.16	50% off 1,882.70	70% off 1,129.62	50% off 1,882.70	50% off 1,882.70	50% off 1,882.70
9	Pipe laying..................	633 lin. ft.	.60 379.80	.50 316.50	.50 316.50	.45 284.85	.60 379.80	.60 379.80
11	6" Underdrain..............	2,000 lin. ft.	.30 600.00	.30 600.00	.30 600.00	.30 600.00	.30 600.00	.30 600.00
15	Cleaning up.................	Lump sum	100.00	500.00	500.00	500.00	500.00	250.00
	Total....................	....	$36,771.06	$37,588.70	$38,816.12	$39,120.45	$39,689.85	$39,871.60

APPENDIX A.

SUMMARY OF BIDS FOR SEC. "A" CASTLEWOOD SEWER. CONTRACT NO. 61.

Opened March 4, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	C. T. McCracken & Co., Columbus, Ohio.	Paul & Kershner, Dayton, Ohio.
1a	Earth Excavation	957 lin. ft.	$ 4.00 3,828.00	$ 2.85 2,727.45	$ 4.00 3,828.00	$ 5.00 4,785.00
1b	Earth Excavation	2,003 lin. ft.	5.00 10,015.00	4.90 9,814.70	5.20 10,415.60	8.00 16,024.00
1c	Earth Excavation	1,588 lin. ft.	5.00 7,940.00	4.30 6,828.40	5.00 7,940.00	7.50 11,910.00
2a	Rock Excavation	1,470 cu. yds.	5.00 7,350.00	4.50 6,615.00	5.50 8,085.00	9.50 13,895.00
3a	Concrete Masonry	1,260 cu. yds.	10.50 13,230.00	11.50 14,490 00	11.00 13,860.00	12.50 15,750.00
3b	Concrete Masonry	30 cu. yds.	21.00 630.00	20.00 600.00	20.00 600.00	20.00 600.00
4	Brick paving	2,760 sq. yds.	2.00 5,520.00	3.20 8,832.00	2.80 7,728.00	3.00 8,280.00
5a	Plain steel	60,800 lbs.	.04	.03½	.03½	.04½
5b	Deformed steel	57,000 lbs.	Sq. lug, .04 2,280.00	.03½ 1,995.00	.03½ 1,995.00	.047 2,679.00
5c	Deformed steel	57,000 lbs.	Johnson Corrugated .04		.03½	.047
6	Excavation below Masonry	20 cu. yds.	2.50 50.00	2.50 50.00	3.00 60.00	3.00 60.00
7	Gravel refill below Masonry	20 cu. yds.	2.50 50.00	3.00 60.00	3.00 60.00	3.00 60.00
8	Vitrified pipe	List price, $2,482.20	55% off 1,116.99	50% off 1,241.10	60% off 992.88	50% off 1,241.10
9	Pipe laying	951 lin. ft.	.40 380.40	.50 475.50	.40 380.40	1.00 951.00
11	8" Underdrain	4,000 lin. ft.	.35 1,400.00	.50 2,000.00	.40 1,600.00	1.00 4,000.00
15	Cleaning up	Lump sum	250.00	400.00	100.00	1,500.00
	Total		$54,040.39	$56,129.15	$57,644.88	$81,805.10

SUMMARY OF BIDS FOR BROOK STREET SEWER. CONTRACT NO. 62.—Opened April 8, 1910.

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	J. Connelly Const. Co., Cleveland, Ohio.	B. C. Milner Sons Co., Louisville, Ky.	Amer. Eng. & Const. Co., Chicago, Ill.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	960 lin. ft.	$ 9.00 8,640.00	$ 13.00 12,480.00	$ 22.00 21,120.00	$ 21.00 20,160.00	$ 33.00 31,680.00
1b	Earth Excavation	2,443 lin. ft.	7.10 17,345.30	13.00 31,759.00	17.60 42,996.80	20.00 48,860.00	26.00 63,518.00
1c	Earth Excavation	773 lin. ft.	7.45 5,758.85	11.00 8,503.00	13.75 10,628.75	19.00 14,687.00	23.00 17,779.00
1d	Earth Excavation	1,024 lin. ft.	6.00 6,144.00	11.00 11,264.00	13.50 13,824.00	18.00 18,432.00	22.00 22,528.00
1e	Earth Excavation	90 cu. yds.	2.00 180.00	1.50 135.00	2.00 180.00	4.00 360.00	3.00 270.00
2a	Rock Excavation	5 cu. yds.	8.00 40.00	6.00 30.00	6.00 30.00	10.00 50.00	10.00 50.00
3a	Concrete Masonry	4,960 cu. yds.	9.00 44,640.00	9.00 44,640.00	9.75 48,360.00	11.00 54,560.00	10.00 49,600.00
3b	Concrete Masonry	40 cu. yds.	20.00 800.00	22.00 880.00	10.00 400.00	20.00 800.00	20.00 800.00
4a	Brick Masonry	8 cu. yds.	15.00 120.00	15.00 120.00	10.00 80.00	10.00 80.00	20.00 160.00
4b	Vitrified brick paving........	70 sq. yds.	3.00 210.00	2.00 140.00	3.00 210.00	3.00 210.00	3.00 210.00
5a	Plain steel	512,000 lbs.	.035	.04	.035	.039	.0375
5b	Deformed steel	495,000 lbs.	Johnson Corrugated .035 17,325.00	Johnson, .04 19,800.00	Havemeyer, .035 17,325.00	Maxwell or Corr., .04	Sq. lug, .0375 18,562.50
5c	Deformed steel	495,000 lbs.	Gen. Fireproof or Havemeyer, .035	......	Sq. lug, .035	.0395 19,552.50	Corr., .0375
6	Excavation below Masonry..	50 cu. yds.	3.50 175.00	3.00 150.00	4.00 200.00	2.00 100.00	4.00 200.00
7	Gravel refill	50 cu. yds.	3.50 175.00	2.50 125.00	3.00 150.00	2.00 100.00	3.00 150.00
8	Vitrified pipe	List price, $1,220.45	50% off 610.22	50% off 610.23	50% off 610.23	60% off 488.18	50% off 610.23
9	Pipe laying	60 lin. ft.	.50 30.00	1.00 60.00	.75 45.00	1.00 60.00	1.00 60.00
11	8″ Underdrain	1,000 lin. ft.	.20 200.00	.35 350.00	.50 500.00	.40 400.00	.50 500.00
15	Cleaning up	Lump sum	250.00	500.00	1,500.00	500.00	100.00
	Total................	....	$102,643.37	$131,546.23	$158,159.78	$179,399.68	$206,777 73

SUMMARY OF BIDS FOR SEC. "A," FRANKFORT AVE. SEWER. CONTRACT NO. 63.

Opened April 1, 1910.

	ITEMS	QUANTITIES	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	1,017 lin. ft.	$ 6.90 7,017.30	$ 8.40 8,542.80	$ 9.90 10,068.30	$ 10.50 10,678.50
1b	Earth Excavation	955 lin. ft.	6.50 6,207.50	6.60 6,303.00	7.00 6,685.00	8.25 7,878.75
1c	Earth Excavation	365 lin. ft.	5.60 2,044.00	5.20 1,898.00	7.00 2,555.00	8.25 3,011.25
1d	Earth Excavation	38 lin. ft.	8.60 326.80	12.40 471.20	15.00 570.00	20.00 760.00
2a	Rock Excavation	420 cu. yds.	5.50 2,310.00	6.50 2,730.00	8.00 3,360.00	9.00 3,780.00
3a	Concrete Masonry	50 cu. yds.	12.00 600.00	16.00 800.00	15.00 750.00	21.00 1,050.00
3b	Concrete Masonry	5 cu. yds.	11.00 55.00	12.50 62.50	12.00 60.00	10.00 50.00
6	Excavation below Masonry.	10 cu. yds.	2.50 25.00	4.00 40.00	4.00 40.00	2.50 25.00
7	Gravel refill	10 cu. yds.	2.50 25.00	4.00 40.00	4.00 40.00	2.50 25.00
8	Vitrified pipe	List price, $4,793.15	55% off 2,156.92	50% off 2,396.58	60% off 1,917 26	55% off 2,156.92
9	Pipe laying	4,714 lin. ft.	.30 1,414.20	.22 1,037.08	.20 942.80	.50 2,357.00
11	8" Underdrain	2,377 lin. ft.	.40 950.80	.45 1,069.65	.10 237.70	.35 831.95
15	Cleaning up	Lump sum	300.00	300.00	300.00	100.00
	Total.................	....	$23,432.52	$25,690.81	$27,526.06	$32,704.37

SUMMARY OF BIDS FOR THIRD STREET SEWER. CONTRACT NO. 64.

Opened April 1, 1910.

	ITEMS	QUANTITIES	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co., Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation	1,447 lin. ft.	$ 8.85 12,805.95	$ 11.25 16,278.75	$ 15.00 21,705.00	$ 16.10 23,296.70
1b	Earth Excavation	1,745 lin. ft.	6.20 10,819.00	8.60 15,007.00	12.00 20,940.00	11.00 19,195.00
1c	Earth Excavation	1,370 lin. ft.	4.25 5,822.50	3.80 5,206.00	6.75 9,247.50	10.00 13,700.00
1d	Earth Excavation, Branch Sewers	70 lin. ft.	7.00 490.00	2.75 192.50	20.00 1,400.00	18.00 1,260.00
3a	Concrete Masonry	575 cu yds.	10.50 6,037.50	12.50 7,187.50	10.50 6,037.50	11.00 6,325.00
3b	Concrete Masonry	450 cu. yds.	12.00 5,400.00	12.50 5,625.00	11.75 5,287.50	13.00 5,850.00
5a	Plain steel	21,900 lbs.	.04	.04	.04	.04
5b	Deformed steel	20,500 lbs.	Sq. lug, .04 820.00	Lug Bars .04 820.00	Sq. lug, .04 820.00	Sq. lug, .04 820.00
5c	Deformed steel	20,500 lbs.	......	Slant Rib, .04	....	Johnson Corr., .04
6	Excavation below Masonry	20 cu. yds.	2.50 50.00	3.00 60.00	2.50 50.00	3.00 60.00
7	Gravel refill	20 cu. yds.	2.50 50.00	3.00 60.00	2.50 50.00	3.00 60.00
8	Vitrified pipe	List price, $1,800.10	50% off 900.05	50% off 900.05	50% off 900.05	50% off 900.05
9	Pipe laying	765 lin. ft.	.40 306.00	.22 168.30	.50 382.50	.25 191.25
11	8" Underdrain	1,000 lin. ft.	.35 350.00	.35 350.00	.35 350.00	.35 350.00
15	Cleaning up	Lump sum	400.00	500.00	100.00	1,000.00
	Total		$44,251.00	$52,355.10	$67,270.05	$73,008.00

SUMMARY OF BIDS FOR FIFTEENTH AND TWENTY-THIRD STS. SEWERS. CONTRACT NO. 65.

Opened April 15, 1910.

	ITEMS	QUANTITIES	B. C. Milner Sons Co., Louisville, Ky.	Guild & Co., Chattanooga, Tenn.	* Jas. Ferry & Sons, Pittsburgh, Pa.	Henry Bickel Co., Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation	456 lin. ft.	$ 10.50 4,788.00	$ 12.40 5,654.40	$ 16.75 7,638.00	$ 15.00 6,840.00	$ 19.20 8,755.20
1b	Earth Excavation	593 lin. ft.	9.85 5,841.05	14.88 8,823.84	15.50 9,191.50	16.00 9,488.00	14.75 8,746.75
3a	Concrete Masonry	445 cu. yds.	9.65 4,294.25	12.50 5,562.50	11.00 4,895.00	15.00 6,675.00	15.00 6,675.00
4	Brick paving	27 sq. yds.	3.00 81.00	3.00 81.00	3.50 94.50	4.00 108.00	3.10 83.70
6	Excavation below Masonry..	10 cu. yds.	3.00 30.00	2.50 25.00	3.00 30.00	3.00 30.00	3.00 30.00
7	Gravel refill	10 cu. yds.	2.00 20.00	2.50 25.00	3.00 30.00	3.00 30.00	3.00 30.00
8	Vitrified pipe	List price, $454.00	50% off 227.00	50% off 227.00	50% off 227.00	50% off 227.00	50% off 227.00
11	8" Underdrain	1,049 lin. ft.	.35 367.15	.35 367.15	.35 367.15	.35 367.15	.35 367.15
15	Cleaning up	Lump sum	350.00	250.00	400.00	100.00	300.00
	Total.................	....	$15,998.45	$21,015.89	$22,873.15	$23,865.15	$25,214.80

*Informal Bid.

SUMMARY OF BIDS FOR SEVENTH AND HILL STS. SEWER. CONTRACT NO. 66.

Bids Opened April 29, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	W. A. Fitch, Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation	332 lin. ft.	$ 13.25	$ 14.00	$ 19.00	$ 18.50	$ 18.00
			4,399.00	4,648.00	6,308.00	6,142.00	5,976.00
1b	Earth Excavation	674 lin. ft.	10.00	8.50	10.20	11.75	11.50
			6,740.00	5,729.00	6,874.80	7,919.50	7,751.00
1c	Earth Excavation	1,150 lin. ft.	6.00	6.60	6.50	10.50	13.00
			6,900.00	7,590.00	7,475.00	12,075.00	14,950.00
1d	Earth Excavation	260 lin. ft.	2.70	3.50	2.80	3.50	4.00
			702.00	910.00	728.00	910.00	1,040.00
3a	Concrete Masonry	445 cu. yds.	12.00	14.75	13.40	12.00	13.00
			5,340.00	6,563.75	5,963.00	5,340.00	5,785.00
4a	Brick paving (Vitrified).....	5 sq. yds.	5.00	3.00	2.50	4.00	4.00
			25.00	15.00	12.50	20.00	20.00
4b	Brick Masonry	10 cu. yds.	12.00	14.75	14.00	20.00	15.00
			120.00	147.50	140.00	200.00	150.00
6	Excavation below Masonry..	10 cu. yds.	3.00	3.50	3.00	3.50	3.00
			30.00	35.00	30.00	35.00	30.00
7	Gravel refill	10 cu. yds.	3.00	2.50	3.00	3.50	3.00
			30.00	25.00	30.00	35.00	30.00
8	Vitrified pipe	List price,	50% off	50% off	50% off	50% off	50% off
		$949.65	474.83	474.83	474.83	474.83	474.83
9	Pipe laying	299 lin. ft.	1.00	.50	.32	.50	.50
			299.00	149.50	95.68	149.50	149.50
15	Cleaning up	Lump sum	500.00	500.00	200.00	500.00	1,500.00
	Total....................	....	$25,559.83	$26,787.58	$28,331.81	$33,800.83	$37,856.33

SUMMARY OF BIDS FOR SEC. "B," MIDDLE FORK SEWER. CONTRACT NO. 67.

Bids opened April 29, 1910.

	ITEMS	QUANTITIES	A. F. Helm, Cleveland, Ohio.	Guild & Co., Chattanooga, Tenn.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	960 lin. ft.	$ 7.00 6,720.00	$ 8.75 8,400.00	$ 6.50 6,240.00
1b	Earth Excavation	2,000 lin. ft.	4.45 8,900.00	4.25 8,500.00	6.50 13,000.00
2a	Rock Excavation	50 cu. yds.	5.00 250.00	7.00 350.00	6.50 325.00
3a	Concrete Masonry, "A"	345 cu. yds.	13.00 4,485.00	14.00 4,830.00	12.00 4,140.00
3b	Concrete Masonry, "B"	340 cu. yds.	13.00 4,420.00	15.00 5,100.00	13.50 4,590.00
3c	Concrete Masonry, "B"	125 cu. yds.	15.00 1,875.00	18.00 2,250.00	18.00 2,250.00
5a	Steel Reinforcing (Plain)	235 lbs.	.05	.04	.05
5b	Steel Reinforcing (Deformed)	220 lbs.	.05 11.00	Johnson, .04 8.80	Sq. lug, .05 11.00
6	Excavation below Masonry	50 cu. yds.	1.50 75.00	3.00 150.00	4.00 200.00
7	Gravel refill	50 cu. yds.	2.50 125.00	3.00 150.00	3.00 150.00
8	Vitrified pipe	List price, $1,182.50	56% off 520.30	50% off 591.25	50% off 591.25
9	Pipe laying	329 lin. ft.	.50 164.50	1.00 329.00	1.00 329.00
11	8" Underdrain	2,960 lin. ft.	.35 1,036.00	.40 1,184.00	.35 1,036.00
12	Timber foundation	21,000 ft. B. M.	18.00 378.00	40.00 840.00	50.00 1,050.00
15	Cleaning up	Lump sum	300.00	500.00	150.00
	Total		$29,259.80	$33,183.05	$34,062.25

SUMMARY OF BIDS FOR SEC. "B," CENTRAL AVENUE SEWER. CONTRACT NO. 68.

Bids opened April 22, 1910.

	ITEMS	QUANTITIES	E. A. Barker & Son Louisville, Ky.	Gray Const. Co., Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	R. L. Clark, Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	W. A. Fitch & Co., Louisville, Ky.
1a	Earth Excavation.	1,040 lin. ft.	$ 1.85 1,924.00	$ 2.35 2,444.00	$ 1.70 1,768.00	$ 2.50 2,600.00	$ 2.43 2,527.20	$ 2.75 2,860.00	$ 5.00 5,200.00
1b	Earth Excavation.	102 lin. ft.	4.00 408.00	3.10 316.20	6.25 637.50	5.00 510.00	5.50 561.00	6.00 612.00	8.50 867.00
3a	Concrete Masonry	40 cu. yds.	9.00 360.00	11.00 440.00	15.00 600.00	15.00 600.00	25.00 1,000.00	16.00 640.00	14.75 590.00
6	Excavation below Masonry	25 cu. yds.	2.00 50.00	2.00 50.00	3.00 75.00	2.50 62.50	1.00 25.00	2.50 62.50	4.50 112.50
7	Gravel refill.....	25 cu. yds.	2.00 50.00	2.25 56.25	3.00 75.00	3.00 75.00	2.00 50.00	2.00 50.00	2.50 62.50
8	Vitrified pipe....	List price, $2,395.30	65% off 838.36	60% off 958.12	55% off 1,077.89	65% off 838.36	50% off 1,197.65	55% off 1,077.89	50% off 1,197.65
9	Pipe laying......	1,042 lin. ft.	.22 229.24	.24 250.08	.28 291.76	.20 208.40	.25 260.50	.50 521.00	.65 677.30
11	8" Underdrain...	1,142 lin. ft.	.35 399.70	.35 399.70	.35 399.70	.35 399.70	.35 399.70	.35 399.70	.35 399.70
15	Cleaning up......	Lump sum	25.00	100.00	200.00	50.00	200.00	50.00	500.00
	Total.....	....	$4,284.30	$5,014.35	$5,124.85	$5,343.96	$6,221.05	$6,273.09	$9,606.65

SUMMARY OF BIDS FOR SEC. "C," NORTHEASTERN SANITARY TRUNK SEWER. CONTRACT NO. 69.

Bids opened June 10, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Duff Const. Co. Cleveland, Ohio.	B. C. Milner Sons Co., Louisville, Ky.	Helm & Henderson Cleveland, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.	Amer. Eng. & Const. Co., Chicago, Ill.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation and refill.......	1,272 lin. ft.	$ 2.00	$ 4.25	$ 3.75	$ 3.77	$ 3.35	$ 4.75	$ 2.50
			2,544.00	5,406.00	4,770.00	4,795.44	4,261.20	6,042.00	3,180.00
1b	Earth Excavation and refill.......	1,675 lin. ft.	2.00	3.25	4.00	3.20	3.90	4.75	4.00
			3,350.00	5,443.75	6,700.00	5,360.00	6,532.50	7,956.25	6,700.00
1c	Earth Excavation and refill.......	332 lin. ft.	2.00	3.75	3.35	3.10	3.00	6.00	3.00
			664.00	1,245.00	1,112.20	1,029.20	996.00	1,992.00	996.00
1d	Earth Ex. and refill (Br. Sewers)	20 lin. ft.	3.00	2.25	3.60	2.00	10.00	5.00	6.00
			60.00	45.00	72.00	40.00	200.00	100.00	120.00
2a	Rock Excavation.	1,200 cu. yds.	5.00	5.00	6.50	7.48	8.50	6.00	8.00
			6,000.00	6,000.00	7,800.00	8,976.00	10,200.00	7,200.00	9,600.00
3a	Concrete Masonry	270 cu. yds.	15.00	15.00	14.00	19.50	17.50	15.00	18.00
			4,050.00	4,050.00	3,780.00	5,265.00	4,725.00	4,050.00	4,860.00
6	Exc. below Masonry	10 cu. yds.	2.00	1.50	4.00	2.00	3.50	2.00	4.00
			20.00	15.00	40.00	20.00	35.00	20.00	40.00
7	Gravel refill below Masonry...	10 cu. yds.	2.00	2.00	2.50	2.40	3.50	2.50	4.00
			20.00	20.00	25.00	24.00	35.00	25.00	40.00
8	Vitrified pipe....	List price, $3,139.33	60% off	55% off	50% off	54% off	50% off	65% off	55% off
			1,255.73	1,412.70	1,569.67	1,444.09	1,569.67	1,098.77	1,412.70
9	Pipe laying	1,468 lin. ft.	.50	.25	.50	.40	.65	.30	1.00
			734.00	367.00	734.00	587.20	954.20	440.40	1,468.00
11	6" Underdrain...	3,299 lin. ft.	.25	.35	.40	.50	.20	.35	.80
			824.75	1,154.65	1,319.60	1,649.50	659.80	1,154.65	2,639.20
15	Cleaning up.....	Lump sum	50.00	150.00	500.00	300.00	500.00	750.00	500.00
	Total.....	....	$19,572.48	$25,309.10	$28,422.47	$29,490.43	$30,668.37	$30,829.07	$31,555.90

SUMMARY OF BIDS FOR SEC. "D," NORTHEASTERN SANITARY TRUNK SEWER. CONTRACT NO. 70.

Bids opened June 10, 1910.

	ITEMS	QUANTITIES	Frank Schefold, New Albany, Ind.	Gray Const. Co., Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	Jas. Duff Const. Co., Cleveland, Ohio.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation and refill..	3,139 lin. ft.	$ 0.65 2,040.35	$ 1.40 4,394.60	$ 1.50 4,708.50	$ 2.60 8,161.40	$ 1.85 5,807.15
1d	Earth Excavation and refill, Branch Sewers...........	230 lin. ft.	.50 115.00	2.00 460.00	5.00 1,150.00	2.60 598.00	2.00 460.00
2a	Rock Excavation...........	700 cu. yds.	5.00 3,500.00	6.00 4,200.00	5.00 3,500.00	4.00 2,800.00	6.75 4,725.00
3a	Concrete Masonry...........	20 cu. yds.	9.00 180.00	12.00 240.00	20.00 400.00	12.00 240.00	20.00 400.00
6	Excavation below Masonry..	10 cu. yds.	1.00 10.00	2.00 20.00	2.00 20.00	1.50 15.00	5.00 50.00
7	Gravel refill below Masonry..	10 cu. yds.	2.00 20.00	2.50 25.00	2.00 20.00	2.00 20.00	5.00 50.00
8	Vitrified pipe................	List price, $6,768.56	68% off 2,165.94	65% off 2,369.00	55% off 3,045.85	55% off 3,045.85	56% off 2,978.17
9	Pipe laying................	3,369 lin. ft.	.25 842.25	.30 1,010.70	.40 1,347.60	.25 842.25	.42 1,414.98
11	6" Underdrain...............	3,369 lin. ft.	.25 842.25	.50 1,684.50	.25 842.25	.35 1,179.15	.40 1,347.60
15	Cleaning up................	Lump sum	150.00	200.00	200.00	50.00	500.00
	Total..................	....	$9,865.79	$14,603.80	$15,234.20	$16,951.65	$17,732.90

SUMMARY OF BIDS FOR SEC. "D," NORTHEASTERN SANITARY TRUNK SEWER. CONTRACT NO. 70.

(Continued.)

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	E. A. Barker & Son Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	B. C. Milner Sons Co., Louisville, Ky.	Helm & Henderson Cleveland, Ohio.	Amer. Eng. & Const. Co., Chicago, Ill.
1a	Earth Excavation and refill..	3,139 lin. ft.	$ 1.90 5,964.10	$ 2.50 7,847.50	$ 2.90 9,103.10	$ 3.25 10,201.75	$ 3.96 12,430.44	$ 4.75 14,910.25
1d	Earth Excavation and refill, Branch Sewers............	230 lin. ft.	2.25 517.50	2.00 460.00	2.50 575.00	2.50 575.00	2.00 460.00	5.00 1,150.00
2a	Rock Excavation............	700 cu. yds.	7.00 4,900.00	7.00 4,900.00	7.00 4,900.00	6.00 4,200.00	6.90 4,830.00	6.50 4,550.00
3a	Concrete Masonry...........	20 cu. yds.	20.00 400.00	20.00 400.00	18.00 360.00	14.00 280.00	26.00 520.00	20.00 400.00
6	Excavation below Masonry..	10 cu. yds.	3.00 30.00	3.00 30.00	3.50 35.00	4.00 40.00	2.00 20.00	2.50 25.00
7	Gravel refill below Masonry..	10 cu. yds.	4.00 40.00	3.00 30.00	3.50 35.00	2.50 25.00	2.50 25.00	2.00 20.00
8	Vitrified pipe................	List price, $6,768.56	60% off 2,707.42	60% off 2,707.43	50% off 3,384.28	50% off 3,384.28	60% off 2,707.42	65% off 2,369.00
9	Pipe laying................	3,369 lin. ft.	1.00 3,369.00	.50 1,684.50	.50 1,684.50	.50 1,684.50	.75 2,526.75	.30 1,010.70
11	6" Underdrain..............	3,369 lin. ft.	.20 673.80	.20 673.80	.20 673.80	.30 1,010.70	.60 2,021.40	.35 1,179.15
15	Cleaning up................	Lump sum	200.00	100.00	500.00	500.00	94.00	500.00
	Total....................	....	$18,801.82	$18,833.23	$21,250.68	$21,901.23	$25,635.01	$26,114.10

SUMMARY OF BIDS FOR SEC. "B," OAK ST. SEWER. CONTRACT NO. 71.

Opened July 8, 1910.

	ITEMS	QUANTITIES	Helm & Henderson Cleveland, Ohio.	Guild & Co., Chattanooga, Tenn	Amer. Eng. & Const. Co., Chicago, Ill.	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co. Louisville, Ky.
1a	Earth Excavation	923 lin. ft.	$ 9.80 9,045.40	$ 9.00 8,307.00	$ 8.00 7,384.00	$ 10.50 9,691.50	$ 10.95 10,106.85	$ 11.00 10,153.00
1b	Earth Excavation	626 lin. ft.	8.95 5,602.70	8.75 5,477.50	11.00 6,886.00	8.90 5,571.40	6.75 4,225.50	8.60 5,383.60
1c	Earth Excavation	1,000 lin. ft.	9.25 9,250.00	11.00 11,000.00	10.40 10,400.00	12.10 12,100.00	12.50 12,500.00	10.60 10,600.00
1d	Earth Excavation (Branch Sewers)	25 lin. ft.	3.00 75.00	5.00 125.00	12.00 300.00	10.00 250.00	7.00 175.00	8.50 212.50
3a	Concrete Masonry, "A"......	680 cu. yds.	13.15 8,942.00	11.50 7,820.00	15.00 10,200.00	10.75 7,310.00	12.00 8,160.00	13.00 8,840.00
3b	Concrete Masonry, "B"......	90 cu. yds.	11.00 990.00	14.00 1,260.00	10.00 900.00	8.00 720.00	10.00 900.00	15.00 1,350.00
3c	Concrete Masonry, "A" in Junction Chamber.........	8 cu. yds.	30.00 240.00	30.00 240.00	20.00 160.00	20.00 160.00	25.00 200.00	20.00 160.00
6	Excavation below Masonry...	10 cu. yds.	2.00 20.00	3.00 30.00	2.00 20.00	2.50 25.00	3.00 30.00	3.00 30.00
7	Gravel refill	10 cu. yds.	2.00 20.00	3.00 30.00	2.00 20.00	2.50 25.00	3.00 30.00	3.00 30.00
8	Vitrified pipe................	List price, $3,765.40	60% off 1,506.16	50% off 1,882.70	70% off 1,129.62	50% off 1,882.70	50% off 1,882.70	50% off 1,882.70
9	Pipe laying..................	633 lin. ft.	.60 379.80	.50 316.50	.50 316.50	.45 284.85	.60 379.80	.60 379.80
11	6" Underdrain...............	2,000 lin. ft.	.30 600.00	.30 600.00	.30 600.00	.30 600.00	.30 600.00	.30 600.00
15	Cleaning up.................	Lump sum	100.00	500.00	500.00	500.00	500.00	250.00
	Total....................	....	$36,771.06	$37,588.70	$38,816.12	$39,120.45	$39,689.85	$39,871.60

SUMMARY OF BIDS FOR SEC. "A," WESTERN INTERCEPTER SEWER. CONTRACT NO. 72.

Opened August 5, 1910.

	ITEMS	QUANTITIES	Guild & Co., Chattanooga, Tenn.	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.
1a	Earth Excavation	3,239 lin. ft.	$ 7.44 24,098.16	$ 9.00 29,151.00	$ 8.30 26,883.70
2a	Rock Excavation	5 cu. yds.	7.00 35.00	.50 2.50	6.00 30.00
3a	Concrete Masonry	1,450 cu. yds.	12.00 17,400.00	9.75 14,137.50	11.75 17,037.50
5a	Plain Steel	67,500 lbs.	.035	.035	.04
5b	Deformed Steel	63,300 lbs.	Johnson Corr., .035 2,215.50	Johnson Bar .035 2,215.50	Sq. lug, .04 2,532.00
5c	Deformed Steel	63,300 lbs.	......	.035	......
6	Excavation below Masonry..........	10 cu. yds.	3.00 30.00	2.00 20.00	3.00 30.00
7	Gravel refill	10 cu. yds.	4.00 40.00	2.00 20.00	3.00 30.00
8	Vitrified pipe	List price, $13.80	50% off 6.90	50% off 6.90	40% off 8.28
11	8" Underdrain	3,000 lin. ft.	.40 1,200.00	.40 1,200.00	.40 1,200.00
15	Cleaning up	Lump sum	200.00	100.00	200.00
	Total..........................	....	$45,225.56	$46,853.40	$47,951.48

SUMMARY OF BIDS FOR SEC. "A," WESTERN INTERCEPTER SEWER. CONTRACT NO. 72.

(Continued.)

	ITEMS	QUANTITIES	Amer. Eng. & Const. Co., Chicago, Ill.	Adams & Sullivan, Louisville, Ky.	Helm & Henderson, Cleveland, Ohio.	B. C. Milner Sons Co., Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation	3,239 lin. ft.	$ 8.13 26,333.07	$ 9.40 30,446.60	$ 9.68 31,353.52	$ 13.85 44,860.15	$ 16.20 52,471.80
2a	Rock Excavation	5 cu. yds.	6.00 30.00	5.00 25.00	5.00 25.00	6.00 30.00	10.00 50.00
3a	Concrete Masonry	1,450 cu. yds.	12.00 17,400.00	10.90 15,805.00	11.94 17,313.00	13.00 18,850.00	10.80 15,660.00
5a	Plain Steel	67,500 lbs.	.0395	.0389	.05 3,375.00	.045	.045 ......
5b	Deformed Steel	63,300 lbs.	Sq. lug, .0395 2,500.35	Cold Twisted, .0392 2,481.36	Johnson, .055	Sq. lug, .045 2,848.50	Johnson, Sq. lug or Cold Twisted, .045 2,848.50
5c	Deformed Steel	63,300 lbs.	Corr. Comp., .04	Johnson Corr., .0394	Ransome, .055	Johnson, .045	Slant Rib, .05
6	Excavation below Masonry..	10 cu. yds.	2.00 20.00	2.00 20.00	2.50 25.00	2.50 25.00	4.00 40.00
7	Gravel refill	10 cu. yds.	2.00 20.00	2.00 20.00	3.00 30.00	2.50 25.00	4.00 40.00
8	Vitrified pipe	List price, $13.80	60% off 5.52	50% off 6.90	60% off 5.52	40% off 8.28	50% off 6.90
11	8" Underdrain	3,000 lin. ft.	.40 1,200.00	.40 1,200.00	.40 1,200.00	.40 12,000.00	.40 1,200.00
15	Cleaning up	Lump sum	500.00	1,000.00	300.00	1,500.00	550.00
	Total....................	....	$48,008.94	$51,004.86	$53,627.04	$69,346.93	$72,867.20

SUMMARY OF BIDS FOR SEC. "F," BEARGRASS INTERCEPTER. CONTRACT NO. 73.

Opened September 2, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Amer. Eng. & Const. Co., Chicago, Ill.	Lynch & Eady, Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.
1a	Earth Excavation	942 lin. ft.	$ 24.00 22,608.00	$ 15.25 14,365.50	$ 25.30 23,832.60	$ 24.00 22,608.00	$ 29.75 28,024.50
1b	Earth Excavation	438 lin. ft.	12.00 5,256.00	15.25 6,679.50	19.80 8,672.40	13.00 5,694.00	23.70 10,380.60
1c	Earth Excavation	682 lin. ft.	7.50 5,115.00	15.25 10,400.50	12.65 8,627.30	13.00 8,866.00	10.00 6,820.00
1d	Earth Excavation	748 lin. ft.	12.00 8,976.00	15.25 11,407.00	19.80 14,810.40	19.00 14,212.00	17.00 12,716.00
2a	Rock Excavation	10 cu. yds.	5.00 50.00	6.00 60.00	10.00 100.00	10.00 100.00	10.00 100.00
3a	Concrete Masonry	625 cu. yds.	10.90 6,812.50	15.00 9,375.00	12.00 7,500.00	16.00 10,000.00	14.00 8,750.00
5a	Plain Steel	21,400 lbs.	.035	.04	.04	.05	.05
5b	Deformed Steel	21,300 lbs.	Johnson, .0375 798.75	.04 852.00	Johnson, .04 852.00	Corr., .05 1,065.00	Sq. lug, .05 1,065.00
5c	Deformed Steel	21,300 lbs.	......	.04	......	......	.05
6	Excavation below Masonry...	40 cu. yds.	3.00 120.00	2.00 80.00	3.00 120.00	5.00 200.00	5.00 200.00
7	Gravel refill below Masonry..	40 cu. yds.	2.50 100.00	2.00 80.00	3.00 120.00	5.00 200.00	3.00 120.00
8	Vitrified pipe	List price, $351.70	50% off 175.85	60% off 140.68	50% off 175.85	No Discount 351.70	50% off 175.85
11	8" Underdrain..............	2,638 lin. ft.	.40 1,055.20	.40 1,055.20	.35 923.30	.50 1,319.00	.40 1,055.20
12	Timber foundation..........	4,100 B. M.	.06 246.00	.04 164.00	.06 246.00	.05 205.00	.07 287.00
15	Cleaning up................	Lump sum	100.00	500.00	500.00	3,000.00	1,000.00
	Total.....................	....	$51,413.30	$55,159.38	$66,479.85	$67,820.70	$70,694.15

SUMMARY OF BIDS FOR SEC. "B," FRANKFORT AVE. SEWER. CONTRACT NO. 74.

Opened October 21, 1910.

	ITEMS	QUANTITIES	Jas. Ferry & Sons, Pittsburgh, Pa.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation	980 lin. ft.	$ 5.30 5,194.00	$ 6.13 6,007.40
1b	Earth Excavation	1,188 lin. ft.	6.40 7,603.20	6.10 7,246.80
2a	Rock Excavation	150 cu. yds.	6.00 900.00	5.00 750.00
3a	Class "A," Concrete Masonry	45 cu yds.	15.00 675.00	20.00 900.00
3b	Class "B," Concrete Masonry	100 cu. yds.	9.00 900.00	9.00 900.00
6	Excavation below Masonry	10 cu. yds.	2.00 20.00	2.00 20.00
7	Gravel refill below Masonry	10 cu. yds.	3.00 30.00	2.00 20.00
8	Vitrified pipe	List price, $5,349.13	60% off 2,139.65	50% off 2,674.56
9	Pipe laying	4,355 lin. ft.	.27 1,175.85	.35 1,524.25
15	Cleaning up	Lump sum	150.00	200.00
	Total		$18,787.70	$20,243.01

	ITEMS	QUANTITIES	Guild & Co., Chattanooga, Tenn.	Jas. Ferry & Sons, Pittsburgh, Pa.	Henry Bickel Co., Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	B. C. Miller Sons Co., Louisville, Ky.
1a	Earth Excavation and refill..	855 lin. ft.	$ 9.40 8,037.00	$ 8.95 7,652.25	$ 10.50 8,977.50	$ 11.20 9,576.00	$ 11.65 9,960.75	$ 14.00 11,970.00
1b	Earth Excavation and refill..	1,416 lin. ft	9.00 12,744.00	9.10 12,885.60	10.00 14,160.00	10.00 14,160.00	11.90 16,850.40	13.00 18,408.00
1c	Earth Excavation and refill..	1,026 lin. ft.	8.00 8,208.00	10.10 10,362.60	10.00 10,260.00	9.25 9,490.50	11.80 12,106.80	12.00 12,312.00
1d	Earth Excavation and refill..	855 lin. ft.	....	....	....	....	....	13.75 11,756.25
1e	Earth Excavation and refill..	1,416 lin. ft.	....	....	....	....	....	12.75 18,054.00
1f	Earth Excavation and refill..	1,026 lin. ft.	....	....	....	....	....	12.00 12,312.00
1g	Earth Excavation and refill for Branch Sewers.........	128 lin. ft.	5.00 640.00	7.50 960.00	4.00 512.00	7.10 908.80	10.00 1,280.00	13.00 1,664.00
3a	Class "A," Concrete Masonry.	1,020 cu. yds.	12.00 12,240.00	10.50 10,710.00	11.50 11,730.00	13.00 13,260.00	14.00 14,280.00	12.00 12,240.00
3c	Class "A," Concrete in manholes	40 cu. yds.	20.00 800.00	18.00 720.00	15.00 600.00	20.00 800.00	20.00 800.00	12.00 480.00
6	Excavation below Masonry..	20 cu. yds.	3.00 60.00	2.50 50.00	2.00 40.00	3.00 60.00	3.00 60.00	3.00 60.00
7	Gravel refill below Masonry..	20 cu. yds.	3.00 60.00	2.50 50.00	2.00 40.00	3.00 60.00	4.00 80.00	2.00 40.00
8	Vitrified pipe	List price, $1,250.40	50% off 625.20	50% off 625.20	60% off 500.16	50% off 625.20	50% off 625.20	50% off 625.20
9	Pipe laying	190 lin. ft.	1.00 190.00	.50 95.00	.60 114.00	.80 152.00	2.00 380.00	.50 95.00
10	Reinforced Concrete pipe....	855 lin. ft. 48" in Place	....	....	....	....	....	5.75 4,916.25
		1,416 lin. ft. 42" in Place	....	....	....	....	....	4.75 6,726.00
		1,026 lin. ft. 36" in Place	....	....	....	....	....	3.75 3,847.50
11	6" Underdrain.............	1,000 lin. ft.	.30 300.00	.30 300.00	.30 300.00	.30 300.00	.30 300.00	.30 300.00
15	Cleaning up................	Lump sum	500.00	200.00	50.00	500.00	300.00	2,500.00
	Total..................	....	$44,404.20	$44,610.65	$47,283.66	$49,892.50	$57,023.15	$60,694.20
				Total for Reinforced Concrete Pipe Sewer...............				$63,376.20

SUMMARY OF BIDS FOR SEC. "C," MIDDLE FORK SEWER. CONTRACT NO. 76.

Bids opened December 30, 1910.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Pittsburgh, Pa.	Sullivan & Long, Bessemer, Ala.	B. O. Milner Sons Co., Louisville, Ky.
1a	Earth Excavation	1,300 lin. ft.	$ 2.20 2,860.00	$ 3.25 4,225.00	$ 3.00 3,900.00	$ 3.85 5,005.00
1b	Earth Excavation	500 lin. ft.	12.50 6,250.00	8.70 4,350.00	11.00 5,500.00	12.50 6,250.00
1c	Earth Excavation	893 lin. ft.	2.50 2,232.50	3.50 3,125.50	3.50 3,125.50	3.85 3,438.05
2a	Rock Excavation	150 cu. yds.	5.00 750.00	5.00 750.00	4.00 600.00	5.75 862.50
3a	Class "B," Concrete Masonry.	575 cu. yds.	12.50 7,187.50	14.00 8,050.00	15.00 8,625.00	12.50 7,187.50
3b	Concrete in manholes........	30 cu. yds.	15.00 450.00	15.00 450.00	15.00 450.00	17.80 534.00
5a	Plain Reinforcing Steel......	1,510 lbs.	Plain, .04	Plain, .05	Plain, .05	Plain, .04
5b	Deformed Reinforcing Steel..	1,500 lbs.	Johnson, .04 60.00	Sq. lug, .05 75.00	Any Bar, .05 75.00	.04 60.00
5c	Deformed Reinforcing Steel.	1,500 lbs.	Sq. lug, .04	......	Any Bar, .05	.04
6	Excavation below Masonry...	20 cu. yds.	2.50 50.00	3.00 60.00	2.00 40.00	3.00 60.00
7	Gravel refill below Masonry..	20 cu. yds.	2.50 50.00	3.00 60.00	3.00 60.00	3.00 60.00
8	Vitrified pipe	List price, $8.90	50% off 4.45	50% off 4.45	50% off 4.45	40% off 5.34
11	8" Underdrain..............	2,693 lin. ft.	.35 942.55	.35 942.55	.40 1,077.20	.55 1,481.15
12	Timber foundation...........	10 M. B. M.	40.00 400.00	50.00 500.00	30.00 300.00	33.00 330.00
15	Cleaning up.................	Lump sum	100.00	500.00	1,000.00	500.00
	Total..................	....	$21,337.00	$23,092.50	$24,757.15	$25,773.54

SUMMARY OF BIDS FOR SECOND STREET SEWER. CONTRACT No. 77.

Bids opened January 20, 1911.

	ITEMS	QUANTITIES	Jas. Ferry & Sons, Pittsburgh, Pa.	Henry Bickel Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	L. W. Hancock Co., Louisville, Ky.	B. C. Milner Sons Co., Louisville, Ky.
1a	Earth Excavation and refill..	1,425 lin. ft.	$ 9.30 13,252.50	$ 10.00 14,250.00	$ 11.20 15,960.00	$ 10.80 15,390.00	$ 15.00 21,375.00
1b	Earth Excavation and refill..	1,005 lin. ft.	7.10 7,135.50	8.50 8,542.50	6.30 6,331.50	7.00 7,035.00	13.00 13,065.00
1d	Earth Excavation and refill, Branch Sewers............	30 lin. ft.	10.00 300.00	6.50 195.00	25.00 750.00	7.00 210.00	13.00 390.00
3a	Concrete Masonry...........	800 cu. yds.	11.50 9,200.00	11.00 8,800.00	11.00 8,800.00	11.50 9,200.00	13.00 10,400.00
3b	Concrete in Branch Sewer; Concrete in manholes......	21 cu. yds.	15.00 315.00	18.00 378.00	15.00 315.00	20.00 420.00	13.00 273.00
4	Brick Masonry.............	5 sq. yds.	3.50 17.50	3.00 15.00	5.00 25.00	5.00 25.00	4.60 23.00
6	Excavation below Masonry..	10 cu. yds.	3.00 30.00	2.00 20.00	4.00 40.00	4.00 40.00	2.30 23.00
7	Gravel refill below Masonry..	10 cu. yds.	3.00 30.00	1.50 15.00	4.00 40.00	4.00 40.00	2.30 23.00
8	Vitrified pipe...............	List price, $551.60	50% off 275.80	60% off 220.64	50% off 275.80	50% off 275.80	46% off 297.86
11	8" Underdrain...............	300 lin. ft.	.35 105.00	.35 105.00	.35 105.00	.35 105.00	.35 105.00
15	Cleaning up................	Lump sum	500.00	......	150.00	500.00	1,300.00
	Total....................	....	$31,161.30	$32,541.14	$32,792.30	$33,240.80	$47,274.86

SUMMARY OF BIDS FOR FOURTH STREET SEWER. CONTRACT NO. 78.

Bids opened March 24, 1911.

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.	R. D. Smith & Co., Louisville, Ky.	Edwin S. Larson, Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.	Henry Bickel Co., Louisville, Ky.
1a	Earth Excavation and refill..	554 lin. ft.	$ 2.15 1,191.10	$ 2.90 1,606.60	$ 2.95 1,634.30	$ 3.40 1,883.60	$ 3.00 1,662.00	$ 3.45 1,927.92
1e	Exc. Catch Basin Conn......	40 lin. ft.	2.00 80.00	2.50 100.00	1.70 68.00	3.00 120.00	2.00 80.00	2.56 102.40
3a	Class "A," Concrete Masonry	5 cu. yds.	13.00 65.00	18.00 90.00	15.00 75.00	15.00 75.00	14.50 72.50	20.00 100.00
3b	Class "B," Concrete Masonry	35 cu. yds.	7.00 245.00	7.50 262.50	8.50 297.50	9.00 315.00	8.50 297.50	10.00 350.00
6	Excavation below Masonry..	5 cu. yds.	2.00 10.00	2.00 10.00	1.00 5.00	.50 2.50	2.00 10.00	2.00 10.00
7	Gravel refill below Masonry..	5 cu. yds.	2.00 10.00	2.50 12.50	2.10 10.50	.50 2.50	2.00 10.00	2.00 10.00
8	Vitrified pipe...............	List price, $1,926.50	80% off 385.30	65% off 674.28	60% off 770.60	66% 655.01	60% off 770.60	60% off 770.60
9	Pipe laying.................	606 lin. ft.	.20 121.20	.25 151.50	.30 181.80	.30 181.80	.38 230.28	.35 212.10
11	6" Underdrain..............	500 lin. ft.	.30 150.00	.30 150.00	.30 150.00	.30 150.00	.30 150.00	.30 150.00
15	Cleaning up................	Lump sum	50.00	200.00	175.00	25.00	200.00	300.00
	Total....................	....	$2,307.60	$3,257.38	$3,367.70	$3,410.41	$3,482.88	$3,933.02

SUMMARY OF BIDS FOR TWENTY-EIGHTH STREET SEWER. CONTRACT NO. 79.

Bids opened March 24, 1911.

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	R. D. Smith & Co., Louisville, Ky.	Lynch & Eady, Louisville, Ky.	Edwin S. Larson, Louisville, Ky.
1a	Earth Excavation and refill.....	500 lin. ft.	$ 1.00 500.00	$ 0.80 400.00	$ 1.17 585.00	$ 2.13 1,065.00
1b	Earth Excavation and refill.....	490 lin. ft.	1.00 490.00	1.00 490.00	1.35 661.50	1.85 906.50
1c	Earth Excavation and refill.....	290 lin. ft.	.50 145.00	.70 203.00	.80 232.00	1.25 362.50
1d	Exc. Catch Basin Conn..........	120 lin. ft.	1.00 120.00	1.00 120.00	1.00 120.00	1.00 120.00
3a	Class "A," Concrete Masonry...	10 cu. yds.	15.00 150.00	12.50 125.00	20.00 200.00	15.00 150.00
3b	Class "B," Concrete Masonry...	70 cu. yds.	6.00 420.00	7.50 525.00	6.00 420.00	10.00 700.00
6	Excavation below Masonry.....	50 cu. yds.	2.50 125.00	1.00 50.00	2.00 100.00	1.00 50.00
7	Gravel refill below Masonry....	50 cu. yds.	2.00 100.00	2.10 105.00	2.00 100.00	1.00 50.00
8	Vitrified pipe	List price, $4,402.14	80% off 880.43	70% off 1,320.64	70% off 1,320.64	66% off 1,496.73
9	Pipe laying	1,400 lin. ft.	.20 280.00	.30 420.00	.25 350.00	.12 168.00
11	8" Underdrain	800 lin. ft.	.25 200.00	.40 320.00	.30 240.00	.10 80.00
15	Cleaning up	Lump sum	100.00	50.00	100.00	30.00
	Total......................	....	$3,510.43	$4,128.64	$4,429.14	$5,178.73

SUMMARY OF BIDS FOR TWENTY-EIGHTH STREET SEWER. CONTRACT NO. 79.

(Continued.)

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Duff Const. Co., Cleveland, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation and refill.....	500 lin. ft.	$ 1.18 590.00	$ 2.40 1,200.00	$ 1.90 950.00	$ 2.00 1,000.00
1b	Earth Excavation and refill.....	490 lin. ft.	1.43 700.70	2.40 1,176.00	1.60 784.00	2.00 980.00
1c	Earth Excavation and refill.....	290 lin. ft.	.70 203.00	1.00 290.00	1.30 377.00	1.50 435.00
1d	Exc. Catch Basin Conn.........	120 lin. ft.	.96 115.20	.70 84.00	1.50 180.00	1.50 180.00
3a	Class "A," Concrete Masonry...	10 cu. yds.	18.00 180.00	15.00 150.00	18.00 180.00	15.00 150.00
3b	Class "B," Concrete Masonry...	70 cu. yds.	9.50 665.00	10.00 700.00	7.50 525.00	9.00 630.00
6	Excavation below Masonry.....	50 cu. yds.	2.00 100.00	1.00 50.00	1.50 75.00	4.00 200.00
7	Gravel refill below Masonry....	50 cu. yds.	2.00 100.00	1.50 75.00	2.50 125.00	4.00 200.00
8	Vitrified pipe	List price, $4,402.14	60% off 1,760.86	70% off 1,320.64	65% off 1,540.75	60% off 1,760.86
9	Pipe laying	1,400 lin. ft.	.35 490.00	.10 140.00	.25 350.00	.40 560.00
11	8" Underdrain	800 lin. ft.	.35 280.00	.15 120.00	.25 200.00	.40 320.00
15	Cleaning up	Lump sum	......	10.00	100.00	150.00
	Total......................	....	$5,184.76	$5,315.64	$5,386.75	$6,565.86

SUMMARY OF BIDS FOR CEDAR STREET SEWER. CONTRACT NO. 80.

Bids opened March 24, 1911.

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	Edwin S. Larson, Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	L. W. Hancock Co. Louisville, Ky.	Lynch & Eady, Louisville, Ky.	Jas. Duff Const. Co Cleveland, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.
1a	Earth Excavation and refill.......	727 lin. ft.	$ 5.15 3,744.05	$ 9.00 6,543.00	$ 9.00 6,543.00	$ 8.95 6,506.65	$ 12.00 8,724.00	$ 15.00 10,905.00	$ 15.00 10,905.00
1b	Excavation for Br. Sewers	43 lin. ft.	5.15 221.45	5.00 215.00	6.73 289.39	15.00 645.00	20.00 860.00	15.00 645.00	15.00 645.00
3a	Class "A," Concrete	417 cu. yds.	12.00 5,004.00	11.00 4,587.00	12.00 5,004.00	14.00 5,838.00	10.00 4,170.00	9.00 3,753.00	12.50 5,212.50
4	Brick paving	11 sq. yds.	4.00 44.00	4.00 44.00	3.00 33.00	3.50 38.50	5.00 55.00	3.00 33.00	3.50 38.50
5a	Plain Steel	3,900 lbs.	.05	.04	.04	.04 156.00	.05	.04	.06 ......
5b	Deformed Steel..	3,700 lbs.	Corr., .05 185.00	Sq. lug, .35 129.50	Johnson, .04 148.00	Sq. lug, .04¼	Gen.F.P., .05 185.00	Corr., .04 148.00	Sq. lug, .06 222.00
5c	Deformed Steel..	3,700 lbs.	......	......	......	Johnson, .04¼	......	Gen.F.P., .04	......
6	Exc. below Mas..	10 cu. yds.	4.00 40.00	2.00 20.00	2.00 20.00	4.00 40.00	3.00 30.00	2.00 20.00	3.00 30.00
7	Gravel refill below Masonry...	10 cu. yds.	4.00 40.00	2.00 20.00	2.00 20.00	4.00 40.00	2.50 25.00	2.35 23.50	3.00 30.00
8	Vitrified pipe....	List price, $101.40	50% off 50.70	50% off 50.70	60% off 40.56	50% off 50.70	65% off 35.49	50% off 50.70	50% off 50.70
11	8" Underdrain...	730 lin. ft.	1.00 730.00	.50 365.00	.35 255.50	.55 401.50	....	.40 292.00	.50 365.00
15	Cleaning up.....	Lump sum	500.00	270.00	......	300.00	300.00	100.00	100.00
	Total.........	....	$10,559.20	$12,244.20	$12,353.45	$14,016.35	$14,384.49*	$15,970.20	$17,598.70

*Informal Bid.

SUMMARY OF BIDS FOR LONG AVENUE SEWER. CONTRACT NO. 81.

Bids opened July 7, 1911.

	ITEMS	QUANTITIES	Koppleman & Eady, Paris, Ky.	Henry Bickel Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation	5,245 lin. ft.	$ 1.80 9,441.00	$ 1.70 8,916.50	$ 2.40 12,588.00
2a	Rock Excavation	450 cu. yds.	4.00 1,800.00	5.00 2,250.00	6.00 2,700.00
3a	Concrete	50 cu. yds.	12.00 600.00	15.00 750.00	16.00 800.00
6	Excavation below Masonry	10 cu. yds.	3.00 30.00	3.00 30.00	4.00 40.00
7	Gravel below Masonry	10 cu. yds.	3.00 30.00	3.00 30.00	4.00 40.00
8	Vitrified pipe	List price, $10,127.35	65% off 3,544.57	70% off 3,038.21	65% off 3,544.57
9	Pipe laying	5,245 lin. ft.	.25 1,311.25	.40 2,098.00	.50 2,622.50
11	8" Underdrain	5,245 lin. ft.	.35 1,835.75	.30 1,573.50	.20 1,049.00
15	Cleaning up	Lump sum	300.00	500.00	50.00
	Total		$18,892.57	$19,186.21	$23,434.07

SUMMARY OF BIDS FOR SEC. "D," MIDDLE FORK SEWER. CONTRACT NO. 82.

Bids opened August 4, 1911.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.
1a	Earth Excavation	1,800 lin. ft.	$ 3.20 5,760.00	$ 3.00 5,400.00
1b	Earth Excavation	1,679 lin. ft.	1.50 2,518.50	3.00 5,037.00
1d	Earth Excavation	112 lin. ft.	2.90 324.80	3.00 336.00
2a	Rock Excavation	50 cu. yds.	4.00 200.00	6.00 300.00
3a	Concrete	600 cu. yds.	11.00 6,600.00	13.50 8,100.00
3b	Concrete	150 cu. yds.	15.00 2,250.00	17.00 2,550.00
5a	Plain Steel	350 lbs.	.05	......
5b or 5c	Deformed Steel	330 lbs.	.05 16.50	.10 33.00
6	Excavation below Masonry	20 cu. yds.	1.50 30.00	4.00 80.00
7	Gravel refill below Masonry	20 cu. yds.	1.75 35.00	4.00 80.00
8	Vitrified pipe	List price, $105.50	60% Dis. 42.20	50% Dis. 52.75
9	Pipe laying	246 lin. ft.	1.00 246.00	3.50 861.00
11	8" Underdrain	3,591 lin. ft.	.35 1,256.85	.25 897.75
15	Cleaning up	Lump sum	50.00	500.00
	Total	....	$19,329.85	$24,227.50

SUMMARY OF BIDS FOR THIRTY-FOURTH STREET SEWER. CONTRACT NO. 83.

Bids opened August 4, 1911.

	ITEMS	QUANTITIES	C. T. McCracken & Co., Columbus, Ohio.	Henry Bickel Co., Louisville, Ky.	B. C. Milner Sons Co., Louisville, Ky.
1a	Earth Excavation	788 lin. ft.	$ 4.90 3,861.20	$ 5.40 4,255.20	$ 8.75 6,895.00
1b	Earth Excavation	230 lin. ft.	1.50 345.00	1.65 379.50	3.00 690.00
3a	Concrete	280 cu. yds.	10.00 2,800.00	10.00 2,800.00	12.85 3,598.00
4	Brick paving	16 sq. yds.	3.00 48.00	3.00 48.00	3.00 48.00
6	Excavation below Masonry	20 cu. yds.	1.00 20.00	1.25 25.00	2.50 50.00
7	Gravel refill below Masonry	20 cu. yds.	1.00 20.00	1.50 30.00	2.50 50.00
8	Vitrified pipe	List price $382.95	70% Dis. 114.89	70% Dis. 114.89	60% Dis. 153.18
9	Pipe laying	230 lin. ft.	.30 69.00	.30 69.00	.50 115.00
11	8" Underdrain	1,018 lin. ft.	.10 101.80	.35 356.30	.40 407.20
15	Cleaning up	Lump sum	100.00	....	200.00
	Total	....	$7,479.89	$8,077.89	$12,206.38

SUMMARY OF BIDS FOR ALTA AVENUE SEWER. CONTRACT NO. 84.

Bids opened August 18, 1911.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	C. T. McCracken & Co., Columbus, Ohio.	Jas. Ferry & Sons, Pittsburgh, Pa.	B. C. Milner Sons Co., Louisville, Ky.
1a	Earth Excavation	4,220 lin. ft.	$ 2.75 11,605.00	$ 3.20 13,504.00	$ 3.90 16,458.00	$ 5.00 21,100.00
2a	Rock Excavation	1,430 cu. yds.	4.00 5,720.00	4.50 6,435.00	3.00 4,290.00	6.00 8,580.00
3a	Concrete Masonry	675 cu. yds.	12.00 8,100.00	12.50 8,437.50	14.00 9,450.00	17.00 11,475.00
6	Excavation below Masonry	10 cu. yds.	2.00 20.00	4.00 40.00	3.00 30.00	2.00 20.00
7	Gravel refill below Masonry	10 cu. yds.	2.00 20.00	4.00 40.00	3.00 30.00	2.00 20.00
8	Vitrified pipe	List price, $4,913.43	70% off 1,474.03	60% off 1,965.37	55% off 2,211.04	50% off 2,456.72
9	Pipe laying	4,804 lin. ft.	.25 1,201.00	.40 1,921.60	.30 1,441.20	.50 2,402.00
11	8" Underdrain	2,000 lin. ft.	.35 700.00	.30 600.00	.30 600.00	.40 800.00
15	Cleaning up	Lump sum	500.00	200.00	200.00	2,000.00
	Total		$29,340.03	$33,143.47	$34,710.24	$48,853.72

SUMMARY OF BIDS FOR THIRTY-SECOND STREET AND DUMESNIL STREET SEWER. CONTRACT NO. 85.

Bids opened October 20, 1911.

	ITEMS	QUANTITIES	Henry Bickel Co., Louisville, Ky.	Jas. Ferry & Sons, Co., Pittsburgh, Pa.	B. C. Milner Sons Co., Louisville, Ky.	Chas. E. Cannel, Columbus, Ohio.
1a	Earth Excavation, Thirty-second St..	1,454 lin. ft.	$ 7.95 11,559.30	$ 8.75 12,722.50	$ 8.00 11,632.00	$ 12.00 17,448.00
1b	Earth Excavation, Dumesnil St......	851 lin. ft.	1.39 1,182.89	2.00 1,702.00	2.50 2,127.50	2.00 1,702.00
3a	Concrete, Thirty-second St..........	843 cu. yds.	8.50 7,165.50	8.50 7,165.50	12.50 10,537.50	10.00 8,430.00
3b	Concrete, Dumesnil St...............	158 cu. yds.	9.00 1,422.00	11.00 1,738.00	13.50 2,133.00	11.00 1,738.00
3c	Concrete Manholes and Inlets........	85 cu. yds.	15.00 1,275.00	18.00 1,530.00	13.50 1,147.50	16.00 1,360.00
4	Brick paving	18 sq. yds.	2.50 45.00	3.00 54.00	2.50 45.00	4.00 72.00
6	Excavation below Masonry..........	10 cu. yds.	1.00 10.00	3.00 30.00	2.00 20.00	4.00 40.00
7	Gravel refill	10 cu. yds.	1.50 15.00	3.00 30.00	2.00 20.00	4.00 40.00
8	Vitrified pipe	List price, $734.05	60% off 293.62	40% off 440.43	50% off 367.03	50% off 367.03
9	Pipe laying	16 lin. ft.	.50 8.00	1.00 16.00	.50 8.00	3.00 48.00
11	Underdrain	500 lin. ft.	.30 150.00	.30 150.00	.30 150.00	.30 150.00
15	Cleaning up	Lump sum	......	1,500.00	200.00	150.00
	Total..........................	....	$23,126.31	$27,078.43	$28,387.53	$31,545.03

SUMMARY OF BIDS FOR BARNEY AVENUE SEWER. CONTRACT NO. 86.

Bids opened February 23, 1912.

	ITEMS.	QUANTITIES	H. H. Snyder & Co., Louisville, Ky.	Henry Bickel Co., Louisville, Ky.	W. H. Koppelman, Louisville, Ky.	Jno. H. Cahill, Louisville, Ky.	L. W. Hancock Co., Louisville, Ky.
1a	Earth Excavation	611 lin. ft.	$ 1.50 916.50	$ 1.55 947.05	$ 1.35 824.85	$ 2.50 1,527.50	$ 2.10 1,283.10
1b	Earth Excavation	333 lin. ft.	1.50 499.50	1.78 592.74	1.20 399.60	2.50 832.50	1.50 499.50
1c	Earth Excavation	1,099 lin. ft.	3.00 3,297.00	4.20 4,615.80	3.75 4,121.25	4.00 4,396.00	5.00 5,495.00
2a	Rock Excavation	820 cu. yds.	4.00 3,280.00	3.50 2,870.00	3.75 3,075.00	4.35 3,567.00	7.00 5,740.00
3a	Concrete Masonry, "A"......	305 cu. yds.	10.00 3,050.00	9.00 2,745.00	12.50 3,812.50	10.00 3,050.00	14.00 4,270.00
3b	Concrete Masonry, "A"......	35 cu. yds.	16.00 560.00	15.00 525.00	15.00 525.00	19.00 665.00	16.00 560.00
6	Excavation below Masonry..	10 cu. yds.	2.00 20.00	1.50 15.00	2.00 20.00	2.00 20.00	3.00 30.00
7	Gravel refill	10 cu. yds.	2.00 20.00	2.00 20.00	2.50 25.00	2.00 20.00	3.00 30.00
8	Vitrified pipe	List price, $3,352.55	70% off 1,005.77	70% off 1,005.77	65% off 1,173.39	60% off 1,341.02	52% off 1,609.22
9	Pipe laying	2,657 lin. ft.	.20 531.40	.25 664.25	.20 531.40	.30 797.10	.35 929.95
11	Underdrain	1,000 lin. ft.	.30 300.00	.20 200.00	.35 350.00	.35 350.00	.40 400.00
15	Cleaning up	Lump sum	100.00	......	250.00	300.00	350.00
	Total..................	....	$13,580.17	$14,200.61	$15,107.99	$16,866.12	$21,196.77

APPENDIX B TABLE I

CONTRACTS AND LOCATION OF SEWERS

Contract Number	Name of Sewer	Location of Sewer	Name of Contractor	Date of Contract	Date Completed
1	Happy Hollow	Between High Ave. and the Canal, from 27th. to 21st. Sts.	R.L. Clark & Co.	Aug. 31, 1907	Mar. 11, 1908
2	Sec. B. Southern Outfall	In Woodland Ave. extended, from Sta. 19+00 to 32nd. St.	T.B. Jones & Co.	Jan. 6, 1908	Oct. 30, 1909
[illegible]	B Beargrass Intercepter	Main St. to L. & N. R.R.	Henry Bickel Co.	Jan. 17, 1908	Feb. 29, 1908
74	Sec. B. Frankfort Ave.	Galt Ave. to Kennedy Ave.	James Ferry and Sons	Oct. 31, 1910	Jan. 9, 1911
75	Eighth and St. Catherine Sts.	Oak and 8th. Sts. to 3rd. and St. Catherine Sts.	Day Labor		
76	Sec. C Middle Fork	From near Irving St. to near Long Ave.	Henry Bickel Co.	Jan. 13, 1911	Apr. 26, 1911
77	Sec. A Second St.	From Avery to Burnet Aves.	James Ferry and Sons	Feb. 8, 1911	May 19, 1911
78	Fourth St.	From "A" St. to Hill St.	C.T. McCracken & Co.	Apr. 4, 1911	Apr. 25, 1911
79	Twenty-eighth St.	Walnut St. to Alley south of Market St.	C.T. McCracken & Co.	Apr. 4, 1911	Apr. 28, 1911
80	Cedar St.	From 20th. to 19th. St.	C.T. McCracken & Co.	Apr. 22, 1911	July 18, 1911
81	Long Ave.	Middle Fork of Beargrass Creek to Stilz Ave.	Koppelman and Eady	July 15, 1911	Feb. 10, 1912
82	Sec. D. Middle Fork	In Private Property from near Long and Beargrass Aves. to south of Meadow Rd. in Cherokee Park.	Day Labor		
83	Thirty-fourth St.	Cedar St. to Hanover St. and in Herman St. from 34th. St. westerly	C.T. McCracken & Co.	Aug. 17, 1911	Oct. 2, 1911
84	Alta Ave.	South of Meadow Rd. in Cherokee Park to Alta Ave. north of Bardstown Rd.	Henry Bickel Co.	Sept. 14, 1911	Dec. 19, 1911
85	Thirty-second and Dumesnil Sts.	In 32nd. St., Woodland Ave. to Virginia Ave. & in Dumesnil St., 32nd. St. to Beech St.	Henry Bickel Co.	Dec. 7, 1911	Apr. 12, 1912
86	Barney Ave.	Alta Ave. Sewer in Cherokee Pk. to Everett and Bonnycastle	H.H. Snyder Co.	Mar. 20, 1912	July 17, 1912

APPENDIX B TABLE 2.

DATA RELATING TO QUANTITY AND CHARACTER OF EXCAVATION AND CONTRACT PRICE

Contract Number	Size	Material	Length (feet)	Average Cut (feet)	Nature of Excavation	Pavement	Length of Pavement (Ft.)	Conc. Base	Rock Excavation		Earth Excavation		Method of Earth Excavation
									Quantity (Cu. Yds.)	Price per cu. yd.	Length (feet)	Price per foot	
61	66"	Reinforced Concrete	557	10.5	Clay and Rock	Macadam	1156		1470	5.00			
	57"	" "	1438								2003	5.00	Hand
	48"	Plain "	872								1588	5.00	
	39"	" "	712										
	20"	Vitrified Pipe	948								957	4.00	
62	7'-6" x 10'-0"	Reinforced Concrete	5200	16.6	Sand Gravel Clay and Fill				5	8.00	960	9.00	Stiff-leg derrick
81	22"	Vitrified Pipe	1595	8.6	Clay, Rock and Fill	Unimproved			450	4.00	5245	1.80	Hand
	18"	" "	1121										
	15"	" "	1342										
	12"	" "	391										
	10"	" "	796										
83	45"	Plain Concrete	784	14.1	Clay, Sand and Gravel	Unimproved					788	4.90	S.l. Derrick with
	15"	Vitrified Pipe	228	10.2							230	1.50	Orange-peel & Hand
84	36" & 10"	Pl. Concrete & Vit. Pipe	1210	8.5	Clay and Rock								
	33 & 10"	" "	274										Scrapers
	27 & 10"	" "	935										and Hand
	24 & 10"	" "	1220						1430	4.00	4220	2.75	
	22 & 10"	Vitrified Pipe	217										
	20 & 10"	" "	364			Macadam	83						
85	66"	Plain Concrete	929	21.1	Clay, Sand and Gravel	Unimproved							Scrapers.
	60"	" "	503								1454	7.95	S.l. derrick with
	54"	Pl. Concrete & Vit. Brick	22										Orange-peel
	30"	Plain Concrete	851	7.1							851	1.39	and Hand
86	33 & 10"	Pl. Concrete & Vit. Pipe	646	9.7	Clay and Rock						1099	3.00	Scrapers.
	27 & 8"	" "	443						820	4.00			Cableway
	24 & 8"	" "	346								944	1.50	and Hand
	22 & 8"	Vitrified Pipe	608			Macadam	115						

APPENDIX B TABLE 3

QUANTITIES AND CONTRACT PRICES OF CONCRETE AND STEEL REINFORCEMENT.

Contract Number	Size of Sewer	Cubic Yards of Concrete per linear foot for each Size	Pounds of Steel per linear foot for each Size	Pounds of Steel per cubic yard	Quantity and Cost of Concrete cubic yards	Cost of Steel per cubic yard of Concrete	Cost of Steel per pound.
61	66"	0.47	26.35	56.06	1260@$10.50	2.24	$0.04
	57"	0.39	22.31	57.20	30@21.00	2.29	
	48"	0.31					
	39"	0.22					
62	7'-6"x10'-0"	0.98	33.97	35.49	49600@9.00 400@20.00	3.34	0.035
63	Vit. Pipe						
64	51"	0.40	33.67	84.17	5750@10.50	3.37	0.04
	33"	0.19			450@12.00		
	24"	0.13					
65	4'-6"	0.43			445@9.65		
	4'-0"	0.38					
	3'-9"	0.31					
66	45"	0.33			445@12.00		
	39"	0.26					
	30"	0.18			685@13.00		
67	33"	0.22			1250@15.00		
68	36"	0.22			400@9.00		
69	24"	0.13			270@15.00		
70	Vit. Pipe						
72	5'-0"	0.44	22.37	50.84	1450@12.00	1.78	0.035
73	3'-3"	0.25	24.48	97.92	625@10.90	3.43	0.035
	2'-9"	0.19					
74	Vit. Pipe						
76	33"	0.19			575@12.50 300@15.00		
77	48"	0.38			800@11.00		
	42"	0.29			21@15.00		
78	39" Pipe Rein.	0.07			35@7.00		
79	" " "	0.07			70@6.00		
80	6'-0"	0.56	44.0	76.0	417@12.00	3.80	0.05
	5'-0"	0.59					
	33"	0.17					
81	Vit. Pipe				50@12.00		
83	45"	0.33			280@10.00		
84	36"	0.22			675@12.00		
	33"	0.19					
	27"	0.15					
	24"	0.13					
85	66"	0.61			843@8.50		
	60"	0.53					
	39"	0.39			85@15.00		
	30"	0.18			158@9.00		
86	33"	0.25			305@10.00		
	27"	0.18			35@16.00		
	24"	0.12					

				1.28		110.4	10.24	12.24	384	.116
46	33"	11.2	2.0	0.19		70.0	10.2	37.64	1078	562
	30"			0.18						
	2'-9"			0.19						
74	Pipe	10.9	1.9			130.8				
76	33"	10.9	1.9	0.19		68.1	7.88	36.9	137	116
77	48"	15.7	4.1	0.38		145.3	15.00	38.5	146	120
	42"			0.29						
	30"			0.18						
78	24" Pipe reinforced	8.4	1.2	0.07		55.0	2.78			
79	" " "	8.1	1.2	0.07		83.4	4.88			
80	6'-0"	13.2	4.4	0.56	44.0	48.4	7.87	14.3	434	283
	5'-0"			0.54						
	33"			0.17						
81	Pipe	8.6	1.0			40.7				
83	45	13.2	3.1	0.33		89.0	8.08	23.0	560	560
84	36"	8.5	1.8	0.22		107.7	10.46	49.9	1760	1410
	33"			0.19						
	27"			0.15						
	24"			0.13						
85	66"	15.9	5.2	0.61		119.2	11.10	24.6	935	578
	60"			0.53						
	54"			0.39						
	30"			0.18						
86	33	9.7	3.0	0.25		61.2	5.63	22.4	872	83
	27			0.18						
	24			0.17						

APPENDIX C.

Location and Description of Sewers Constructed by the Commissioners of Sewerage.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
	Alfred St.	Twenty-fifth St.	Twenty-Fourth St.	See	Happy Hollow	Sewer.	
17	Alley, 1st, s. w. of Barret Ave.	Southeastern Sewer, nr. Rufer Ave. (if extended)	193 ft. s. e. of Kentucky St.	454	54"	Pl. Con.	Combined.
17	Alley, 1st, s. w. of Barret Ave.	193 ft. s. e. of Kentucky St.	121 ft. s. e. of Page St.	731	36"	Pl. Con.	Combined.
17	Alley, 1st, s. w. of Barret Ave.	121 ft. s. e. of Page St.	Page St.	161	27"	Vit. Pipe in Con.	Combined.
19	Alley, 1st, w. of Bayly Ave.	10 ft. s. of C. L. of FieldAve.	N. line of Victor Ave.	379	33"	Pl. Con.	Storm Water.
19	Alley, 1st, w. of Bayly Ave.	N. line of Victor Ave.	12 ft. s. of Frankfort Ave. in Bayly Ave.	536	20"	Vit. Pipe	Storm Water.
19	Alley, 1st, w. of Bayly Ave.	Field Ave.	32 ft. s. of Frankfort Ave. in Bayly Ave.	947	8"	Vit. Pipe	Sanitary.
D. L.	Alley, 1st, n. of Broadway	Beargrass Intercepter.	E. bank of Beargrass Cr.	181	18"		Sanitary.
	Alley, n. of Kentucky St.	Underhill St.	Dupuy St.	See	Beargrass	Intercepter.	
30	Alley, 1st, w. of Coral Ave.	S. line of Letterle Ave.	406 ft. s. w. of Letterle Ave	409	27"	Vit. Pipe	Storm Water.
30	Alley, 1st, w. of Coral Ave.	S. line of Letterle Ave.	405 ft. s. w. of Letterle Ave	405	8"	Vit. Pipe	Sanitary.
	Alley, 1st, n. of High Ave.	Twenty-Third St.	Twenty-first St.	See	Happy Hollow	Sewer.	
	Alley, 1st, n. of Letterle Ave.	32 ft. e. of Drescher Bridge St.	Sta. 76+78	See	Northeastern	Sanitary	Trunk Sewer.
	Alley, 1st, s. w. of Norris Pl.	Eastern Parkway	Sta. 7+82	See	Castlewood	Sewer.	
	Alley, 1st, w. of Second St.	S. shoulder of Magnolia Ave., 3 ft. e. of 1st alley, w. of Second St.	22 ft. n. of Magnolia Ave.	50	18"	Vit. Pipe	Combined.
84	Alley, 1st, s. e. of Sherwood Ave.	Private property	Private property	195	24"	Pl. Con.	Storm Water.
84	Alley, 1st, s. e. of Sherwood Ave.	Private property	Private property	195	10"	Vit. Pipe	Sanitary.
59	Alley, 1st, n. of Sycamore Ave.	Jane St. Sewer	103 ft. w. of Jane St.	94	24"	Pipe in Con.	Storm Water.
59	Alley, 1st, n. of Sycamore Ave.	Jane St. Sewer	100 ft. w. of Jane St.	86	8"	Pipe in Con.	Sanitary.
59	Alley, 1st, s. of Sycamore Ave.	Jane St. Sewer	323 ft. w. of Keats Ave.	114	12"	Vit. Pipe	Storm Water.
59	Alley, 1st, s. of Sycamore Ave.	323 ft. w. of Keats Ave.	2 ft. w. of C. L. Keats Ave.	346	18"	Vit. Pipe	Storm Water.
59	Alley, 1st, s. of Sycamore Ave.	Jane St.	Keats Ave.	457	8"	Vit. Pipe	Sanitary.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
86	Alta Ave.	Barney Ave.	Everett Ave.	671	33"	Pl. Con.	Storm Water.
86	Alta Ave.	Barney Ave.	Everett Ave.	646	10"	Vit. Pipe	Sanitary.
19	Aubin Ave.	Edwards Pond Branch	184 ft. n. of Field Ave.	454	27"	Pl. Con. Pipe in Con.	Storm Water.
19	Aubin Ave.	184 ft. n. of Field Ave.	10 ft. n. of C. L. Field Ave.	202	20"	Vit. Pipe	Storm Water.
70	Aubin Ave.	Northeastern Sewer in Letterle Av.	Edwards Pond Branch	191	10"	Vit. Pipe	Sanitary.
19	Aubin Ave.	Edwards Pond Branch	Field Ave.	668	8"	Vit. Pipe	Sanitary.
	Avery Ave.	301 ft. w. of Fourth St.	Brook St.	See	Southern Out	fall.	
8	Bank St. (across)	N. line of Bank St. at 24th St.	S. line of Bank St. at 25th.	108	5' 6"	Pl. Con.	Combined.
86	Barney Ave.	8 ft. s. of Cherokee Rd.	Alta Ave.	337	24"	Pl. Con.	Storm Water.
86	Barney Ave.	8 ft. s. of Cherokee Rd.	Alta Ave.	348	8"	Vit. Pipe	Sanitary.
17	Barret Ave.	13 ft. n. w. of C. L. of Page St.	Morton Ave.	388	42"	Pl. Con.	Combined.
17	Barret Ave.	Morton Ave.	N. E. line of Barret Ave. at Christy Ave.	319	39"	Pl. Con.	Combined.
17	Barret Ave.	19 ft. w. of C. L. of Barret Ave. at Page St.	N. E. line of Barret Ave. at Highland Ave.	128	20"	Vit. Pipe	Combined.
19	Bayly Ave.	12 ft. s. of Frankfort Ave.	Alley (on east) 1st s. of Frankfort Ave.	154	20"	Vit. Pipe	Storm Water.
19	Bayly Ave.	34 ft. s. of Frankfort Ave.	Alley (on east) 1st s. of Frankfort Ave.	133	8"	Vit. Pipe	Sanitary.
	Beargrass Intercepter:						
4	Private property	Ohio River	Fulton St.	850	5' 8"x5' 4½"	Rein. Con.	Sanitary.
4	Mill St.	Fulton St.	245 ft. n. of L. & N. R. R.	1,333	5' 8"x5' 4½"	Rein. Con.	Sanitary.
4	Private property	245 ft. n. of L. & N. R. R.	525 ft. n. of s. line of Franklin St.	439	6' 6"x6' 1½"	Rein. Con.	Sanitary.
4	Buchanan St.	525 ft. n. of s. line of Franklin St.	Story Ave.	1,253	6' 6"x6' 1½"	Rein. Con.	Sanitary.
4	Private property	Story Ave.	S. line of Main St.	755	6' 6"x6' 1½"	Rein. Con.	Sanitary.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
3	Bourbon Stock Yards	S. line of Main St	Sta. 40+70	290	6′ 6″x6′ 1½″	Rein. Con.	Sanitary.
28	L. & N. property	Sta. 40+70	Sta. 42+10	140	6′ 6″x6′ 1½″	Rein. Con.	Sanitary.
28	L. & N. property	Junction Chamber		16		Rein. Con.	Sanitary.
41	L. & N. property	Beargrass Creek	Beargrass Interceptor	65	48″	Pl. Con.	Emer. O'flow.
41	L. & N. and private property	Sta. 42+26	Sta. 69+46	2,720	5′ 2″x4′ 11″	Rein. Con.	Sanitary.
43	Private property	Sta. 69+46	55 ft. s. of n. line of Broadway	1,056	5′ 2″x4′ 11″	Rein. Con.	Sanitary.
43, 16	Broadway	55 ft. s. of n. line of Broadway	Logan St	577	54″	Rein. Con.	Sanitary.
16, 35	Logan St	Broadway	12 ft. s. of C. L. of Caldwell	2,291	54″	Rein. Con.	Sanitary.
35	Logan St	12 ft. s. of C. L. of Caldwell St	N. line of Kentucky St	488	48″	Rein. Con.	Sanitary.
35	Kentucky (if ext. from W.)	Logan St	Underhill St	714	48″	Rein. Con.	Sanitary.
35	Alley, 1st, n. of Kentucky St	Underhill St	Dupuy St	1,428	39″	Rein. Con.	Sanitary.
35	Dupuy St	Alley, 1st, n. of Kentucky	Sta. 137+20	236	39″	Rein. Con.	Sanitary.
60, 73	Schiller Ave	Sta. 137+20	Sta. 146+56	936	39″	Rein. Con.	Sanitary.
60, 73	Schiller Ave	Sta. 146+56	Alley 1st s. of Ellison Ave.	1,224	33″	Pl. Con.	Sanitary.
60, 73	Private prop. (St. M. Cem.)	Alley, 1st, s. of Ellison Ave	Sta. 169+16	1,036	33″	Pl. Con.	Sanitary.
30	Belleaire Ave (across)	W. line of Belleaire Ave., at private property	E. line of Belleaire Ave	22	18″	Vit. Pipe	Storm Water.
30	Belleaire Ave (across)	W. line of Belleaire Ave., at Private property	E. line of Belleaire Ave	19	8″	Vit. Pipe	Sanitary.
30	Belleaire Ave	Sewer in private property	308 ft. n. of Frankfort Ave.	159	18″	Vit. Pipe	Storm Water.
30	Belleaire Ave	308 ft. n. of Frankfort Ave	13 ft. n. of C. L. of Frankfort Ave.	334	15″	Vit. Pipe	Storm Water.
30	Belleaire Ave	454 ft. n. of Frankfort Ave	Frankfort Ave	493	8″	Vit. Pipe	Sanitary.
34	Bismarck Ave	Sewer in Twenty-sixth St	984 ft. w. of Twenty-sixth	1,000	20″	Vit. Pipe	Combined.
58	Bolling Ave	Twenty-first St	25 ft. w. of C. L. of 18th	671	60″	Rein. Con.	Combined.
58	Bolling Ave	25 ft. w. of C. L. of 18th St	McCloskey Ave	826	48″	Pl. Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located	From	To	Length In Feet	Size	Kind	Purpose
58	Bolling Ave.	McCloskey Ave.	740 ft. e. of C. L. of McCloskey Ave.	740	39"	Pl. Con.	Combined.
13	Breckinridge St.	19 ft. n. of C. L. Breckinridge in 9th	24 ft. e. of C. L. of 8th St.	531	54"	Pl. Con.	Combined.
13	Breckinridge St.	24 ft. e. of C. L. of Eighth St.	28 ft. e. of C. L. of 7th St.	479	51"	Pl. Con.	Combined.
13	Breckinridge St.	28 ft. e. of C. L. of Seventh St.	Sewer in Sixth St.	463	45"	Pl. Con.	Combined.
D. L.	Brent St.	31 ft. n. of C. L. of Broadway	162 ft. s. of C. L. of Broadway	192	15"	Vit. Pipe	Sanitary.
10	Broadway	Sewer in Ninth St.	17 ft. e. of C. L. of 7th St.	988	42"	Pl. Con.	Combined.
10	Broadway	17 ft. e. of C. L. of Seventh St.	Sewer in Sixth St.	469	36"	Pl. Con.	Combined.
33	Broadway	Sewer in Twenty-sixth St.	Twenty third St.	1,463	36"	Pl. Con.	Combined.
33	Broadway	Twenty-third St.	11 ft. w. of C. L. of 22d St.	469	24"	Pl. Con.	Combined.
62	Brook St. & Brook St. extended.	Southern Outfall in Avery Ave.	S. line of Southern R. R.	3,470	10' 0"x7' 6"	Rein Con.	Combined.
	Buchanan St.	525 ft. n. of s. line of Franklin St.	Story Ave.	See	Beargrass Int	ercepter.	
D. L.	Caldwell St.	Beargrass Intercepter	Dry Run Sewer	12	24"	Pl. Con.	Sanitary.
	Castlewood Sewer:						
61	Private property	Beargrass Intercepter	Castlewood Combined Sewer at Beargrass Cr.	961	20"	Vit. Pipe	Sanitary.
61	Private property	Beargrass Creek	8 ft. e. of w. line of Barret Ave. (ext.)	586	66"	Rein. Con.	Combined.
61	Private property	8 ft. e. of w. line of Barret (Ext.)	Castlewood Ave.	402	57"	Rein. Con.	Combined.
61	Castlewood Ave.	Private property	Tyler Pk. (Sta. 19+92)	1,004	57"	Rein. Con.	Combined.
61	Tyler Park	Castlewood Ave.	E. line of Baxter Ave.	570	48"	Pl. Con.	Combined.
61	Tyler Park	E. line of Baxter Ave.	Sta. 32+77	715	39"	Pl. Con.	Combined.
61	Tyler Park	Sta. 32+77	Edenside Ave.	118	48"	Pl. Con.	Combined.
61	Edenside Ave.	152 ft. s. of Quadrant Ave.	Quadrant Ave.	182	48"	Pl. Con.	Combined.
61, 26	Quadrant Ave.	Edenside Ave.	149 ft. s. e. of Edenside Av	186	39"	Pl. Con.	Combined.
26	Quadrant Ave.	149 ft. s. e. of Edenside Ave.	Eastern Parkway	224	36"	Pl. Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
26	Eastern Parkway	Quadrant Ave	Alley, 1st, s. w. of Norris Pl.	153	39″	Pl. Con.	Combined.
26	Alley, 1st, s. w. of Norris Pl.	Eastern Parkway	195 ft. s. e. of East'n P'kway.	233	39″	Pl. Con.	Combined.
26	Private property	Alley, 1st, s. w. of Norris Pl.	Norris Pl.	174	36″	Pl. Con.	Combined.
26	Norris Place	Sherwood Ave.	Stevens Ave.	400	36″	Pl. Con.	Combined.
26	Stevens Ave.	Norris Pl.	260 ft. n. e. of Norris Pl.	300	42″	Pl. Con.	Combined.
26	Stevens Ave.	260 ft. n. e. of Norris Pl.	Schwartz Ave.	381	36″	Pl. Con.	Combined.
26	Schwartz Ave.	Stevens Ave.	Duker Ave.	869	42″	Pl. Con.	Combined.
	Castlewood Ave.	See Castlewood Sewer.					
	Cave Hill Cemetery Sewer and	Drain.					
7	City property & C. Hill Cem.	Middle Fork of Beargrass Creek	Sta. 17+15	1,715	5′ 2″x4′ 11″	Rein Con.	Storm Water.
7	Cave Hill Cemetery	Sta. 17+15	Transit Ave.	1,440	2′ 9″x2′ 7″	Rein Con.	Storm Water.
7	City property & C. Hill Cem.	Middle Fork Sewer	Sta. 17+00	1,699	12″	Vit. Pipe	Sanitary.
7	Cave Hill Cemetery	Sta. 17+00	Transit Ave.	1,455	10″	Vit. Pipe	Sanitary.
80	Cedar St.	25 ft. w. of C. L. of 20th St.	Nineteenth St.	706	60″	Pl. Con.	Combined.
80	Cedar St. and 20th St.	Cedar St. Sewer	Twentieth St. Sewer	21	6′ 0″	Rein Con.	Combined.
	Cedar St.	Shawnee Park	Amy Ave.	See	Northwestern	Sewer.	
	Cedar St.	Amy Ave.	Twentieth St.	See	Northwestern	Sewer.	
51	Central Ave.	Seventh St.	Fourth St.	1,453	5′ 6″	Rein. Con.	Combined.
68 & D. L.	Central Ave.	Fourth St.	4 ft. w. of C. L. of Jones St. (on south)	726	36″	Pl. Con.	Combined.
D. L.	Central Ave.	4 ft. w. of C. L. of Jones St. (on so.)	436 ft. e. of Jones St. (on south)	458	22″	Vit. Pipe	Combined.
84	Cherokee Park	Middle Fork Sewer	Sta. 2+75	275	36″	Pl. Con.	Storm Water.
84	Cherokee Park	Sta. 2+75	Sta. 5+49	274	33″	Pl. Con.	Storm Water.
84	Cherokee Park	Sta. 5+49	Sta. 14+84	935	36″	Pl. Con.	Storm Water.
84	Cherokee Park	Sta. 14+84	Sta. 22+77	793	24″	Pl. Con.	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
84	Cherokee Park	Sta. 22+77	Sta. 26+43	366	20″	Vit. Pipe	Storm Water.
84	Cherokee Park	Sta. 26+43	Sherwood Ave.	675	27″	Pl. Con.	Storm Water.
84	Cherokee Park	Middle Fork Sewer	Sherwood Ave.	3,318	10″	Vit. Pipe	Sanitary.
86	Cherokee Park	Alta Ave. Sewer	8 ft. s. of Cherokee Rd.	607	22″	Vit. Pipe	Storm Water.
86	Cherokee Park	Alta Ave. Sewer	8 ft. s. of Cherokee Rd.	607	10″	Vit. Pipe	Sanitary.
	Cherokee Park	See Middle Fork Sewer.					
15	Chestnut St.	Twenty-ninth St.	Twenty-eighth St.	485	24″	Pl. Con.	Combined.
17	Christy Ave.	E. line of Barret Ave.	Edward St.	531	39″	Pl. Con.	Combined.
17	Christy Ave.	Edward St.	Sewer in Rubel Ave.	587	36″	Pl. Con.	Combined.
17	City property	Brent St. or alley s. w. of Barret.	Barret Ave., 118 ft. n. w. of Winter Ave.	243	18″	Vit. Pipe	Combined.
D. L.	City property	East of Logan St.	(Alteration)	19		Rein. Con.	Gate Chamber.
D. L.	City property	Beargrass Intercepter in Schiller Ave.	Southeastern Sewer	402	18″	Vit. Pipe	Sanitary.
23	Clay St.	Ormsby Ave.	Camp St.	349	27″	Pl. Con.	Combined.
23	Clay St.	Camp St.	Rupp St.	295	24″	Pl. Con.	Combined.
23	Clay St.	Rupp St.	S. line of Gwendoline St.	290	20″	Vit. Pipe	Combined.
D. L.	Cooper St.	Old headwall at creek	New channel of Beargrass Creek	26	36″	Pl. Con.	Storm Water.
70, 40	Crescent Ave.	Letterle Ave.	200 ft. s. of Letterle Ave.	230	12″	Vit. Pipe	Sanitary.
40	Crescent Ave.	200 ft. s of Letterle Ave.	191 ft. n. of Field Ave.	380	8″	Vit. Pipe	Sanitary.
40	Crescent Ave.	191 ft. n. of Field Ave.	5 ft. s. of C. L. of Field	222	10″	Vit. Pipe	Sanitary.
40	Crescent Ave.	5 ft. s. of C. L. of Field Ave.	34 ft. s. of n. line of English Ave.	600	10″	Vit. Pipe	Sanitary.
40	Crescent Ave.	34 ft. s. of n, line of English Ave.	19 ft. n. of C. L. of Frankfort Ave.	559	8″	Vit. Pipe	Sanitary.
40	Crescent Ave.	172 ft. s. of n. line of English Ave.	58 ft. n. of Frankfort Ave.	350	12″	Vit. Pipe	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
	Davies Ave.	Seventh St.	Easterly	See	Southern Outfall.		
27	Dearing Court	2 ft. n. e. of C. L. of Everett Ave.	379 ft. n. e. of Everett Ave.	412	10"	Vit. Pipe	Storm Water.
27	Dearing Court	Everett Ave.	376 ft. n. e. of Everett Ave.	409	8"	Vit. Pipe	Sanitary.
52	Dumesnil St.	Fifteenth St. Sewer	14 ft. e. of C. L. of 16th St.	738	48"	Pl. Con.	Combined.
85	Dumesnil St.	At Thirty-second St.		10	24"	Pipe in Con.	Combined.
85	Dumesnil St.	Thirty-second St.	8 ft. e. of Beech St.	837	30"	Pl. Con.	Combined.
	Dupuy St.	Alley, 1st, n. of Kentucky	Schiller Ave.	See	Beargrass Intercepter.		
	Eastern Parkway	Quadrant Ave.	Al. 1st s. w. of Norris Pl.	See	Castlewood Sewer,		
	Edenside Ave.	152 ft. s. of Quadrant Ave.	Quadrant Ave.	See	Castlewood Sewer,		
	Eighteenth St.	St. Louis Ave.	Wilson Ave.	See	Southern Outfall.		
58	Eighteenth St.	Sewer in Bolling Ave.	Sewer in 18th St.	26	22"	Vit. Pipe	Combined.
D. L.	Eighth St.	Oak St. Sewer	8 ft. e. of C. L. of 8th St. in St. Catherine St.	856	48"	Pl. Con.	Combined.
39	Elliott Ave.	Twenty-sixth St. Sewer	445 ft. w. of 24th St.	500	20"	Vit. Pipe	Combined.
39	Elliott Ave.	445 ft. w. of Twenty-fourth St.	Twenty-fourth St.	474	15"	Vit. Pipe	Combined.
40	English Ave.	Crescent Ave.	447 ft. e. of Crescent Ave.	476	12"	Vit. Pipe	Storm Water.
40	English Ave.	5 ft. w. of C. L. Crescent Ave.	459 ft. e. of Crescent Ave.	493	8"	Vit. Pipe	Sanitary.
27	Everett Ave.	Transit Ave.	2 ft. s. e. of C. L. of Dearing Ct.	313	12"	Vit. Pipe	Storm Water.
27	Everett Ave.	3 ft. s. e. of C. L. of Transit Ave.	Dearing Ct.	316	8"	Vit. Pipe	Sanitary.
27	Everett Ave.	2 ft. n. w. of C. L. of Transit Ave.	122 ft. n. w. of Slaughter	513	10"	Vit. Pipe	Storm Water.
27	Everett Ave.	3 ft s. e. of C. L. of Transit Ave.	119 ft. n. w. of Slaughter.	515	8"	Vit. Pipe	Sanitary.
86	Everett Ave.	Alta Ave.	Barney Ave.	431	27"	Pl. Con.	Storm Water.
86	Everett Ave.	Alta Ave.	Barney Ave.	445	8"	Vit. Pipe	Sanitary.
50	Ewing Ave.	Edwards Pond Branch	14 ft. n. of C. L. of Calvin	645	30"	Pl. Con.	Storm Water.
50	Ewing Ave.	14 ft. n. of C. L. Calvin Ave.	126 ft. s. of Calvin Ave.	161	24"	Vit. Pipe	Storm Water.
50	Ewing Ave.	126 ft. s. of Calvin Ave.	16 ft. s. of C. L. Sycamore	293	22"	Vit. Pipe	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
50	Ewing Ave.	16 ft. s. of C. L. Sycamore Ave.	56 ft. n. of L. & N. R. R.	363	15″	Vit. Pipe	Storm Water.
50	Ewing Ave.	Northeastern Sanitary Sewer	46 ft n. of L. & N R. R.	1,500	8″	Vit. Pipe	Sanitary.
19	Field Ave.	Aubin Ave.	122 ft. e. of Bayly Ave.	107	20″	Vit. Pipe	Storm Water.
19	Field Ave.	122 ft. e. of Bayly Ave.	Alley, 1st, w. of Bayly Ave.	355	36″	Pl. Con.	Storm Water.
19	Field Ave.	Aubin Ave.	Alley, 1st, w. of Bayly Ave.	460	8″	Vit. Pipe	Sanitary.
40	Field Ave.	5 ft. w. of C. L. of Crescent Ave. (n. of Field Ave.)	6 ft. w. of C. L. of Crescent Ave. (s of Field)	133	10″	Vit. Pipe	Sanitary.
65	Fifteenth St.	Southern Outfall in Wilson Ave.	26 ft. n. of C. L. of Wilson	19	45″	Pl. Con.	Combined.
65	Fifteenth St.	26 ft. n. of C. L. of Wilson Ave.	Sewer in Ormsby Ave.	437	48″	Pl. Con.	Combined.
62	Floyd St.	226 ft. s. of Southern R. R.	1,197 ft. s. of S'thern R. R.	971	10′ 0″x7′ 6″	Rein. Con.	Combined.
51	Fourth St.	Central Ave.	National Turnpike	313	5′ 6″	Rein. Con.	Combined.
78	Fourth St.	Sewer in A St.	14 ft. n. of C. L. of Hill St.	487	24″	V. P. in Con.	Combined.
D. L.	Fourth St.	4 ft. w. of w. line of 4th St. in York.	189 ft. s. of York St.	205	18″	Vit. Pipe	Combined.
30	Frankfort Ave.	13 ft. n. of C. L. Frankfort Ave in Belleaire Ave.	28 ft. e. of Coral Ave.	200	15″	Vit. Pipe	Storm Water.
30	Frankfort Ave.	Belleaire Ave.	42 ft. e. of Coral Ave.	190	8″	Vit. Pipe	Sanitary.
30	Frankfort Ave.	13 ft. n. of C. L. of Frankfort Ave. in Belleaire Ave.	W. line of Vernon Ave.	509	22″	Vit. Pipe	Storm Water.
30	Frankfort Ave.	W. line of Vernon Ave.	277 ft. e. of Vernon Ave.	336	18″	Vit. Pipe	Storm Water.
30	Frankfort Ave.	277 ft. e. of Vernon Ave.	369 ft. e. of Vernon Ave.	105	12″	Vit. Pipe	Storm Water.
30	Frankfort Ave.	Belleaire Ave.	381 ft. e. of Vernon Ave.	942	8″	Vit. Pipe	Sanitary.
63	Frankfort Ave.	5 ft. w. of C. L. of Jane St.	188 ft. w. of Cavewood Ave	1,013	15″	Vit. Pipe	Storm Water.
63	Frankfort Ave.	2 ft. w. of C. L. of Jane St.	188 ft. w. of Cavewood Ave	1,015	8″	Vit. Pipe	Sanitary.
63	Frankfort Ave.	2 ft. w. of C. L. of Jane St.	3 ft. w. of C. L. of Keats	415	18″	Vit. Pipe	Storm Water.
63	Frankfort Ave.	3 ft. w. of C. L. of Keats Ave.	30 ft. w. of Raymond Ave.	541	12″	Vit. Pipe	Storm Water.
63	Frankfort Ave.	2 ft. w. of C. L. of Jane St.	30 ft. w. of Raymond Ave.	956	8″	Vit. Pipe	Sanitary.
63	Frankfort Ave.	65 ft. w. of Peterson Ave.	41 ft. e. of Raymond Ave.	365	12″	Vit. Pipe	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
63	Frankfort Ave.	63 ft. w. of Peterson Ave.	41 ft. e. of Raymond Ave.	365	8″	Vit. Pipe	Sanitary.
50	Frankfort Ave.	6 ft. w. of C. L. of Peterson Ave. (on north)	2 ft. w, of C. L. of Galt Ave	567	27″	Pl. Con.	Storm Water.
50	Frankfort Ave.	3 ft. w. of C. L. of Peterson Ave. (on north)	Galt Ave.	561	8″	Vit. Pipe	Sanitary.
74	Frankfort Ave.	4 ft. w. of C. L. of Galt Ave.	4 ft. w. of C. L. of Franck	338	24″	Vit. Pipe	Storm Water.
74	Frankfort Ave.	4 ft. w. of C. L. of Franck Ave.	4 ft. w. of C. L. of Hite Ave (on south)	370	18″	Vit. Pipe	Storm Water.
74	Frankfort Ave.	4 ft. w. of C. L. of Hite Ave. (on south)	W. line of S. Bayly Ave.	276	12″	Vit. Pipe	Storm Water.
74	Frankfort Ave.	Galt Ave.	W. line of S. Bayly Ave.	981	8″	Vit. Pipe	Sanitary.
74	Frankfort Ave.	Sewer in Bayly Ave.	6 ft. w. of C. L. of Birchwood Ave.	637	18″	Vit. Pipe	Storm Water.
74	Frankfort Ave.	6 ft. w. of C. L. of Birchwood Ave.	6 ft. w. of C. L. of Kennedy	547	15″	Vit. Pipe	Storm Water.
74	Frankfort Ave.	Sewer in Bayly Ave.	Kennedy Ave.	1,184	8″	Vit. Pipe	Sanitary.
50	Galt Ave.	15 ft. s. of Frankfort Ave.	9 ft. n, of C. L. of Payne	431	15″	Vit. Pipe	Storm Water.
50	Galt Ave.	18 ft. s. of Frankfort Ave.	Payne St.	437	8″	Vit. Pipe	Sanitary.
27	Glenmary Ave.	Willow Ave.	71 ft. n. e. of Everett Ave.	350	10″	Vit. Pipe	Storm Water.
27	Glenmary Ave.	Willow Ave.	66 ft. n. e. of Everett Ave.	350	8″	Vit. Pipe	Sanitary.
D. L.	Green St.	Old Headwall	New channel Beargrass Cr.	27	36″	Pl. Con.	Storm Water.
12	Green St.	Sewer at Garden St.	18 ft. w. of C. L. of Wenzel	723	24″	Pl. Con.	Combined.
12	Green St.	18 ft. w. of C. L. of Wenzel St.	Campbell St.	566	36″	Pl. Con.	Combined.
12	Green St.	Campbell St.	Sewer in Shelby St.	587	24″	Pl. Con.	Combined.
	Hamilton Ave.	518 ft. n. e, of Mellwood Ave.	Payne St.	See	Middle Fork	Sewer,	
1	Happy Hollow Sewer: Private property, Alfred St. and 1st alley n. of High Ave.	Sewer in 27th St.	21st St. if extended	3,485	8′ 6″x7′ 4″	Rein. Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
1	Twenty-first St. (if extended.)	1st alley n. of High Ave.	Sewer in 21st St., 140 ft. n. e. of High Ave.	142	5′ 6″x4′ 8″	Rein. Con.	Combined.
83	Herman St.	Thirty-fourth St.	203 ft. w. of 34th St.	233	15″	Vit. Pipe	Combined.
8	High Ave.	Twenty-sixth St. (on South)	S. line of High Ave. at 24th St.	997	5′ 10″x5′ 6½″	Rein. Con.	Combined.
66	Hill St.	Southern Outfall at Ninth St.	24 ft. e. of C. L. of 9th St.	32	45″	Pl. Con.	Combined.
66	Hill St.	24 ft. e. of C. L. of Ninth St.	23 ft. w. of C. L. of 7th St.	299	39″	Pl. Con.	Combined.
66	Hill St.	23 ft. w. of C. L. of Seventh St.	45 ft. e. of C. L. of L. & N. R. R. Crossing	675	30″	Pl. Con.	Combined.
66	Hill St.	45 ft. e. of C. L. of L. & N. R. R. Crossing	W. line of Al. 1st w. of 6th.	193	12″	Vit. Pipe	Combined.
	Hill St.	10 ft. e. of Twelfth St.	10 ft. w. of 9th in Hill St.	See	Southern Outfall.		
78	Hill St.	Fourth St.	Sewer in n. sidewalk of Hill St.	56	18″	Vit. Pipe	Combined.
18	Hoertz Ave.	Sewer in Goss Ave.	19 ft. n. e. of C. L. of Mulberry St.	813	60″	Pl. Con.	Combined.
18	Hoertz Ave.	19 ft. n. e. of C. L. of Mulberry St.	15 ft. n. e. of C. L. of Lydia	365	54″	Pl. Con.	Combined.
18	Hoertz Ave.	15 ft. n. e. of C. L. of Lydia St.	14 ft. n. e. C. L. of Milton	365	51″	Pl. Con.	Combined.
18	Hoertz Ave.	14 ft. n. e. of C. L. of Milton St.	19 ft. n. e. C. L. of Burnett	378	48″	Pl. Con.	Combined.
18	Hoertz Ave.	19 ft. n. e. of C. L. of Burnett Ave.	20 ft. n. e. C. L. of Sylvia.	379	42″	Pl. Con.	Combined.
18	Hoertz Ave.	20 ft n. e. of C. L. of Sylvia St.	129 ft. n. e. of Forest Ave.	342	30″	Pl. Con.	Combined.
18	Hoertz Ave.	129 ft. n. e. of Forest St.	Forest St.	159	18″	Vit. Pipe	Combined.
59	Jane St.	Edwards Pond Branch	182 ft. s. of Edwards Pond Branch	182	24″	Vit. Pipe	Storm Water.
59	Jane St.	182 ft. s. of Edwards Pond Branch.	1st alley n. of Sycamore	515	33″	Pl. Con.	Storm Water.
59	Jane St.	Sycamore Ave.	1st alley, s. of Sycamore.	253	27″	Pl. Con.	Storm Water.
59	Jane St.	1st alley s. of Sycamore Ave.	Frankfort Ave.	467	24″	Pl. Con.	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
59	Jane St.	Northeastern Sewer	40 ft. s. Edwards Pd. Br.	61	12″	Vit. Pipe	Sanitary.
59	Jane St.	40 ft. s. of Edwards Pond Branch	187 ft. s. Edwards Pd. Br.	147	8″	Vit. Pipe	Sanitary.
59	Jane St.	187 ft.s.ofEdwards Pond Branch	1st alley n. of Sycamore	526	10″	Vit. Pipe	Sanitary.
59	Jane St.	Sycamore Ave.	Frankfort Ave.	725	8″	Vit. Pipe	Sanitary.
9	Jefferson St.	N. line of Jefferson St. at 25th St.	25 ft. e. of 25th St.	94	52″	Pl. Con.	Combined.
9	Jefferson St.	25 ft. e. of Twenty-fifth St.	S. line of Jeff. St. at 24th.	179	45″	Pl. Con.	Combined.
57	Jefferson St.	Twenty-first Street	Twenty-second St.	467	22″	Vit. Pipe	Combined.
57	Jefferson St.	Twenty-second St.	Twenty-third St.	684	18″	Vit. Pipe	Combined.
59	Keats Ave.	1st alley s. of Sycamore Ave.	34 ft. n. of L. & N. R. R.	211	12″	Vit. Pipe	Storm Water.
59	Keats Ave.	1st alley s. of Sycamore Ave.	5 ft. s. of C. L. Sycamore.	235	15″	Vit. Pipe	Storm Water.
59	Keats Ave.	5 ft. s. of C. L. of Sycamore Ave.	631 ft. n. of Sycamore Ave.	657	12″	Vit. Pipe	Storm Water.
59	Keats Ave.	25 ft. n. of L. & N. R. R.	639 ft. n. of Sycamore Ave.	1,128	8″	Vit. Pipe	Sanitary.
30	Letterle Ave. (across)	Edwards Pond Branch	1st alley w. of Coral Ave.	78	2′ 0″x2′ 10″	Rein. Con.	Storm Water.
30	Letterle Ave. (across)	Northeastern Sanitary Sewer	1st alley w. of Coral Ave.	88	8″	Vit. Pipe	Sanitary.
	Letterle Ave.	246 ft. w. of Coral Ave.	173 ft. e. of Vernon Ave.	See	Northeastern	Sanitary	Sewer.
	Letterle Ave.	617 ft. w. of Catalpa Ave.	Crescent Ave.	See	Northeastern	Sanitary	Sewer.
	Logan St.	Broadway	N. line of Kentucky St.	See	Beargrass Int	ercepter.	
81	Long Ave.	E. shoulder Peterson Ave.	Franck Ave.	633	22″	Vit. Pipe	Sanitary.
81	Long Ave.	Franck Ave.	1,100 ft. e. of Franck Ave.	1,120	18″	Vit. Pipe	Sanitary.
81	Long Ave.	1,100 ft. e. of Franck Ave.	Kennedy Ave.	1,227	15″	Vit. Pipe	Sanitary.
81	Long Ave.	Kennedy Ave.	115 ft. w. of Crescent Ct.	392	12″	Vit. Pipe	Sanitary.
81	Long Ave.	115 ft. w. of Crescent Ct.	Stiltz Ave.	795	10″	Vit. Pipe	Sanitary.
62	L. & N. R. R. property	Brook St. (if extended)	226 ft. s. of Southern R. R. in Floyd St.	731	10′ 0″x7′ 6″	Rein. Con.	Combined.
D. L.	L. & N. R. R. property	Beargrass Intercepter	Green St. Sewer	22	12″	Vit. Pipe	Sanitary.
D. L.	L. & N. R. R. property	Beargrass Intercepter	Cooper St. Sewer connection	134	8″	Vit. Pipe	Sanitary.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
47	Madison St.	Sewer in Twentieth St.	Twenty-first St.	274	24″	Pl. Con.	Combined.
47	Madison St.	Twenty-first St.	Twenty-second St.	480	22″	Vit. Pipe	Combined.
47	Madison St.	Twenty-second St.	Twenty-fourth St.	1,226	18″	Vit. Pipe	Combined.
38	Magazine St.	Sewer in Twenty-sixth St.	470 ft. e. of 26th St.	500	20″	Vit. Pipe	Combined.
38	Magazine St.	470 ft. e. of Twenty-sixth St.	Twenty-fourth St.	497	18″	Vit. Pipe	Combined.
D. L.	Magnolia Ave.	22 ft. w. of Second St.	1st alley w. of Second St.	209	30″	Pl. Con.	Combined.
D. L.	Main St. (north sidewalk)	Beargrass Intercepter	186 ft. e. of Beargrass Intercepter	182	20″	Vit. Pipe	Sanitary.
	Mellwood Ave.	21 ft. e. of w. line of Mellwood Ave.	E. line of Mellwood Ave. at Schoeffel Ave.	See	Northeastern	Sanitary	Sewer.
	Middle Fork Sewer:						
28	Private property	Beargrass Intercepter	Hamilton Ave. 518 ft. n. e. of Mellwood Ave.	1,210	39″	Rein. Con.	Sanitary.
28	Hamilton Ave.	518 ft. n. e. of Mellwood Ave.	Payne St.	1,004	39″	Rein. Con.	
28	City property	Payne St.	Sta. 32+42	1,028	39″	Rein. Con.	Sanitary.
67	City and private property	Sta. 32+42	Sta. 62+101 nr. Valley Av.	2,959	36″	Rein. Con.	Sanitary.
76	Private property	Sta. 62+01	Sta. 88+87 nr. Raymond Av.	2,686	33″	Rein. Con.	Sanitary.
D. L.	Private property & Cher. Pk.	Sta. 88+87	Sta. 123+38 (in Cherokee Pk. s. of Meadow Rd.)	3,451	30″	Pl. Con.	Sanitary.
D. L.	Cherokee Park	Middle Fork of Beargrass Creek	Alta Avenue Sewer	108	27″x45″	Pl. Con.	Storm Water.
	Mill St.	Fulton St.	245 ft. n. of L. & N. R. R.	See	Beargrass In	tercepter.	
18	Morgan St.	Hoertz Ave. on n. w.	Hoertz Ave. on s. e.	212	30″	Pl. Con.	Combined.
51	National Turnpike	Fourth St.	Southern Parkway	1,286	5′ 6″	Rein. Con.	Combined.
80, 46	Nineteenth St.	29 ft. w. of C. L. of 19th St. in Cedar St.	Madison St.	915	33″	Pl. Con.	Combined.
46	Nineteenth St.	Madison St.	Chestnut St.	402	30″	Pl. Con.	Combined.
46	Nineteenth St.	Chestnut St.	Magazine St.	479	24″	Pl. Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
46	Nineteenth St.	Magazine St.	10 ft. n. C. L. Broadway.	477	22″	Vit. Pipe	Combined.
13	Ninth St.	Sewer in York St.	19 ft. n. C. L. Breckinridge	714	54″	Pl. Con.	Combined.
	Ninth St.	Hill St.	Seventh St.	See	Southern Outfall.		
	Norris Place	Sherwood Ave.	Stevens Ave.	See	Castlewood Sewer.		
	Northeastern Sanitary Sewer:						
36	Private property	Beargrass Intercepter in Mill St. north of L. & N. R. R.	31 ft. w. of Mellwood Ave.	5,613	5′ 7½″x4′ 0″	Rein. Con.	Sanitary.
36, 31	Private property	31 ft. w. of Mellwood Ave.	21 ft. e. of w. line Mellwood.	55	39″	Pl. Con.	Sanitary.
36	Private property	16 ft. e. of Beargrass Creek	21 ft. w. of Mellwood Ave.	171	30″	Pipe in Con.	Emer. O'flow.
31	Mellwood Ave.	21 ft. e. of w. line of Mellwood Ave.	E. line of Mellwood Ave. at Schoeffel	158	30″	Pl. Con.	Sanitary.
31	Schoeffel Ave.	E. line of Mellwood Ave.	18 ft. e. of Edwards Pd. Br.	528	30″	Pl. Con.	Sanitary.
31	Private property	18 ft. e. of Edwards Pond Branch.	1st alley n. of Letterle Ave.	667	30″	Pl. Con.	Sanitary.
31	1st alley n. of Letterle Ave.	32 ft. e. of C. L. of Drescher Bridge St.	Private property	658	24″	Pl. Con.	Sanitary.
31	Private property	1st alley n. of Letterle Ave.	Letterle Ave., 246 ft. w. of Coral Ave.	243	24″	Pl. Con.	Sanitary.
69	Letterle Ave.	246 ft. w. of Coral Ave.	173 ft. e. of Vernon Ave.	1,271	24″	Pl. Con.	Sanitary.
69	Private property	173 ft. e. of Vernon Ave.	Jane St.	558	24″	Pl. Con.	Sanitary.
69	Private property	Jane St.	Ewing Ave.	541	20″	Vit. Pipe	Sanitary.
69	Private property	Ewing Avenue	Letterle Ave.	576	18″	Vit. Pipe	Sanitary.
69	Letterle Ave.	617 ft. w. of Catalpa Ave.	286 ft. w. of Catalpa Ave.	331	18″	Vit. Pipe	Sanitary.
70	Letterle Ave.	286 ft. w. of Catalpa Ave.	Catalpa Ave.	302	22″	Vit. Pipe	Sanitary.
70	Letterle Ave.	Catalpa Ave.	389 ft. e. of Catalpa Ave.	404	18″	Vit. Pipe	Sanitary.
70	Letterle Ave.	389 ft. e. of Catalpa Ave.	785 ft. e. of Catalpa Ave.	396	20″	Vit. Pipe	Sanitary.
70	Letterle Ave.	785 ft. e. of Catalpa Ave.	Aubin Ave.	823	18″	Vit. Pipe	Sanitary.
70	Letterle Ave.	Aubin Ave.	547 ft. e. of Aubin Ave.	577	15″	Vit. Pipe	Sanitary.
70	Letterle Ave.	547 ft. e. of Aubin Ave.	Crescent Ave.	639	18″	Vit. Pipe	Sanitary.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
	Northeastern Storm Drain:						
36	Private property	Culvert at Letterle Ave. (Cut Off Rd.)	E. s. of Beargrass Intercepter nr. Mill St.	4,210	6′ 0″x4′ 9″ to 4′ 9″x2′ 0″	Rein. Con.	Storm Water.
4	Private property nr. Mill St.	E. side of Beargrass Intercepter	W. s. of Beargrass Intercepter nr. Mill St.	10	36″	Rein. Con.	Storm Water.
D. L.	Private property	W. side of Beargrass Intercepter	Campbell St., 15 ft. no. of Big Four Conn.	700	36″	Pl. Con.	Storm Water.
	Northwestern Sewer:						
42, 53	Shawnee Park	Ohio River	212 ft. e. of River Rd.	432	6′ 8″x6′ 0″	Rein. Con.	Storm Water.
53	Shawnee Park	212 ft. e. of River Rd.	Cedar St. (if extended)	3,196	13′ 6″x9′ 0″	Rein. Con.	Combined.
53	Cedar St. (if extended)	Shawnee Park	730 ft. w. of 41st St.	342	13′ 6″x9′ 0″	Rein. Con.	Combined.
54	Cedar St. (if extended)	730 ft. w. of Forty-first St.	772 ft. w. of Garr's Rd.	1,101	12′ 0″x9′ 0″	Rein. Con.	Combined.
54	Cedar St. (if extended)	772 ft. w. of Garrs Rd.	Garr's Road	792	9′ 6″x9′ 0″	Rein. Con.	Combined.
54	Cedar St. (if extended)	Garrs Rd.	Amy Ave.	824	9′ 0″	Rein. Con.	Combined.
55	Cedar St.	Amy Avenue	Thirty-fourth St.	1,718	8′ 3″	Rein. Con.	Combined.
55	Cedar St.	Thirty-fourth St.	Twenty-eighth St.	3,133	6′ 9″	Rein. Con.	Combined.
48	Cedar St.	Twenty-eighth St.	Twenty-sixth St.	836	6′ 3″	Rein. Con.	Combined.
48, 80	Cedar St.	Twenty-sixth St.	25 ft. w. of C. L. of 20th St.	2,766	6′ 0″	Rein. Con.	Combined.
D. L.	O St.	Sewer in Seventh St.	Sixth Street	475	18″	Vit. Pipe	Combined.
D. L.	O St.	Sixth St.	Sewer in O St. at Sixth	27	15″	Vit. Pipe	Combined.
52	Oak St.	16 ft. s. of C. L. of Oak St. in 16th.	18 ft. e. of C. L. of 17th St. (on north)	848	33″	Pl. Con.	Combined.
D. L.	Oak St.	Sewer in Fourth St.	202 ft. w. of Fourth St.	238	18″	Vit. Pipe	Combined.
32	Oak St.	Twelfth St.	4 ft. e. of 11th St.	580	5′ 0″	Re.Con.Pipe	Combined.
32 & D. L.	Oak St.	4 ft. e. of Eleventh St.	W. line of Eighth St.	1,308	54″	Pl. Con.	Combined.
D. L.	Oak St.	W. line of Eighth St.	18 ft. e. of C. L. of 7th St.	592	27″	Pipe in Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
D. L.	Oak St.	Twelfth St.	967 ft. w. of 12th St.	1,008	42"	Pl. Con.	Combined.
17	Page St.	Brent St. or alley s. w. of Barret	Barret Ave.	256	36"	Pl. Con.	Combined.
17	Page St.	Sewer in Page St. 23 ft. w. of C. L. Barret Ave.	19 ft. w. C. L. Barret Ave.	4	20"	Vit. Pipe	Combined.
17	Page St.	Sewer in 1st alley s. w. of Barret	Jacob Ave.	289	18"	Vit. Pipe	Combined.
50	Peterson Ave.	Lex Ave.	Frankfort Ave.	129	18"	Vit. Pipe	Storm Water.
50	Peterson Ave.	Lex Ave.	Frankfort Ave.	135	8"	Vit. Pipe	Sanitary.
81	Peterson Ave.	20 ft. n. of Long Ave.	S. shoulder Long Ave.	66	15"	Vit. Pipe	Sanitary.
8	Portland Ave. (across)	N. line Portland Ave. at 24th St.	C. L. Portland Ave.	42	5' 10"x5' 6½"	Rein. Con.	Combined.
8	Portland Ave. (across)	C. L. Portland Ave.	S. line of Port. Ave. at 24th	38	5' 6"	Pl. Con.	Combined.
30	Private property	Alley, 1st, w. of Coral Ave.	Sta. 8+32	342	27"	Vit. Pipe	Storm Water.
30	Private property	Sta. 8+32	Sta. 11+00	268	24"	Vit. Pipe	Storm Water.
30	Private property	Sta. 11+00	Coral Ave.	108	33"	Pl. Con.	Storm Water.
30	Private property	Alley, 1st, w. of Coral Ave.	Coral Ave.	724	8"	Vit. Pipe	Sanitary.
30	Private property	Coral Ave.	Sta. 14+26	218	33"	Pl. Con.	Storm Water.
30	Private property	Sta. 14+26	W. line of Belleaire Ave.	147	20"	Vit. Pipe	Storm Water.
30	Private property	E. line of Belleaire Ave.	6 ft. w. of Vernon Ave.	463	20"	Vit. Pipe	Storm Water.
30	Private property	Coral Ave.	W. line of Belleaire Ave.	356	8"	Vit. Pipe	Sanitary.
30	Private property	Belleaire Ave.	Vernon Ave.	479	8"	Vit. Pipe	Sanitary.
59	Private property	1st alley, n. of Sycamore Ave.	Sycamore Ave.	182	24"	Pipe in Con.	Storm Water.
59	Private property	1st alley n. of Sycamore Ave.	Sycamore Ave.	189	8"	Vit. Pipe	Sanitary.
D. L.	Private property line of 2d alley, s. w. of Baxter Ave.	Beargrass Intercepter	165 ft. n. of Hamilton Ave.	127	8"	Vit. Pipe	Sanitary.
D. L.	Private property	Middle Fork Sewer	Enterprise Sewer	1,190	18"	Vit. Pipe	Sanitary.
50	Private property	Ewing Ave.	Point in Doll property	319	27"	Pl. Con.	Storm Water.
50	Private property	Point in Doll property	Peterson (north of Frankfort Ave.)	319	22"	Vit. Pipe	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
50	Private property	Ewing Ave.	Peterson (north of Frankfort Ave.)	632	8"	Vit. Pipe	Sanitary.
81	Private property	Middle Fork Sewer	20 ft. w. of Peterson Ave.	962	22"	Vit. Pipe	Sanitary.
81	Private property	20 ft. w. of Peterson Ave.	Center of Peterson Ave.	50	15"	Vit. Pipe	Sanitary.
84	Private property	Sherwood Ave.	1st alley s. e. of Sherwood	232	24"	Pl. Con.	Storm Water.
84	Private property	Sherwood Ave.	1st alley s. e. of Sherwood	235	10"	Vit. Pipe	Sanitary.
84	Private property	1st alley, s. e. of Sherwood Ave.	Alta Ave.	222	22"	Vit. Pipe	Storm Water.
84	Private property	1st alley, s. e. of Sherwood Ave.	Alta Ave.	222	10"	Vit. Pipe	Sanitary.
D. L.	Private property	N. line of Main Street	Sta. 7+60	574	20"	Vit. Pipe	Sanitary.
D. L.	Private property	Sta. 7+60	2 ft. s. of C. L. of Webster	589	18"	Vit. Pipe	Sanitary.
D. L.	Private property, line of Cooper	11 ft. n. of Cooper St. Sewer	Cooper St. Sewer	11	8"	Vit. Pipe	Sanitary.
41 & D. L.	Priv. prop. n. e. Beargrass Cr.	487 ft. n. e. of Cooper St. Sewer	367 ft. s. w. of Cooper St. Sewer	852	8"	Vit. Pipe	Sanitary.
	Private property	See Middle Fork Sewer.					
	Private property	See Northeastern Sanitary Sewer.					
	Private property	See Northeastern Storm Drain.					
	Private property	See Beargrass Intercepter.					
	Private property	See Southern Outfall.					
	Private property	See Castlewood Sewer.					
	Private property	See Happy Hollow Sewer.					
	Private property	See Western Intercepter.					
	Quadrant Ave.	Edenside Ave.	Eastern Parkway	See	Castlewood Sewer.		
	Schiller Ave.	Dupuy St.	1st alley s. of Ellison Ave.	See	Beargrass Intercepter.		
	Schoeffel Ave.	E. line of Mellwood Ave.	18 ft. e. of Edwards Pd. Br.	See	Northeastern	Sanitary	Sewer.
	Schwartz Ave.	Stevens Ave.	Duker Ave.	See	Castlewood Sewer.		
77	Second St.	Avery Ave.	16 ft. n. of C. L. of A St.	1,455	48"	Pl. Con.	Combined.
77	Second St.	16 ft. n. of C. L. of A St.	Sewer in 2d St., 6 ft. s. of n. line Burnett Ave.	976	42"	Pl. Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
77	Second St.	15 ft. s. of C. L. of A St.	Sewer in A St.	30	30″	Pl. Con.	Combined.
D. L.	Second St.	7 ft. n. of C. L. Burnett Ave.	22 ft. w. of C. L. 2d St. in Magnolia Ave.	662	36″	Pl. Con.	Combined.
D. L.	Second St.	6 ft. s. line Magnolia Ave.	3 ft. n. of s. line Magnolia	13	20″	Vit. Pipe	Combined.
66	Seventh St.	Sewer in Hill St.	N. line of Hill St.	37	18″	Vit. Pipe	Combined.
66	Seventh St.	N. line Hill St.	Sewer in Magnolia Ave.	1,098	30″	Pl. Con.	Combined.
29, 45	Seventh St. (if extended from s.)	Southern Outfall (Davies Ave., ex.)	S. line of L St.	3,836	10′ 0″	Rein Con.	Combined.
51	Seventh St.	S. line of L St.	Central Ave.	1,836	9′ 6′	Rein Con.	Combined.
	Seventh St.	Ninth St.	Davies Ave.	See	Southern Out	fall.	
84	Sherwood Ave.	1,480 ft. n. e. of Bardstown Rd.	1,225 ft. n. e. Bardstown Rd	258	27″	Pl. Con.	Storm Water.
84	Sherwood Ave.	1,480 ft. n. e. of Bardstown Rd.	1,225 ft. n. e. Bardstown Rd	255	10″	Vit. Pipe	Sanitary.
52	Sixteenth St.	14 ft. e. of C. L. 16th St. in Dumesnil St.	16 ft. s. of C. L. Oak St.	379	42″	Pl. Con.	Combined.
37	Sixteenth St.	Breckinridge St.	16 ft. s. of C. L. Arbegust	420	39″	Pl. Con.	Combined.
37	Sixteenth St.	16 ft. s. of C. L. Arbegust St.	Maple St.	436	33″	Pl. Con.	Combined.
37	Sixteenth St.	Maple St.	8 ft. s. of C. L. of Anderson	379	27″	Pl. Con.	Combined.
27	Slaughter Ave.	2 ft. e. of C. L. Willow St.	20 ft. n. e. of C. L. Everett	609	18″	Vit. Pipe	Storm Water.
27	Slaughter Ave.	Willow St.	59 ft. n. e of Everett Ave.	527	8″	Vit. Pipe	Sanitary.
	Southern Outfall:						
6	Private property	Ohio River	47 ft. easterly	47	8′ 0″	Rein Con.	Combined.
6	Private property	47 ft. easterly	139 ft. easterly	92	8′ 0″x9′ 0″	Rein Con.	Combined.
6	Private property	139 ft. easterly	Sta. 19+ 00 in State F. Gds	1,900	10′ 7″x10′ 1½″	Rein Con.	Combined.
2	State Fair Grounds	Sta. 19+00	Thirty-eighth St.	3,337	15′ 6″x15′ 2″	Rein Con.	Combined.
2	Woodland Ave.	Thirty-eighth St.	Thirty-fourth St.	1,841	15′ 6″x14′ 5″	Rein Con.	Combined.
2	Woodland Ave.	Thirty-fourth St.	19 ft. w. of C. L. 32d St.	965	14′ 3″x13′ 11″	Rein Con.	Combined.
5	Woodland Ave.	19 ft. w. of C. L. of 32d St.	16 ft. n. e. of C. L. Woodland in Cane Run Rd.	3,004	14′ 0″x13′ 8″	Rein Con.	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
5	Cane Run Rd.	16 ft. n. e. of C. L. Woodland Ave.	21 ft. e. C. L. Cane Run Rd in St. Louis Ave.	758	14′ 0″x13′ 8″	Rein Con.	Combined.
5, 11	St. Louis Ave.	21 ft. e. of C. L. of Cane Run Rd.	6 ft. w. of C L of 23d St.	517	14′ 0″x13′ 8″	Rein Con.	Combined.
11	St. Louis Ave.	6 ft. w. of C. L. Twenty-third St.	6 ft. w. of C. L. of 21st St.	712	13′ 9″x13′ 6″	Rein Con.	Combined.
11	St. Louis Ave.	6 ft. w. of C. L. Twenty-first St.	12 ft w. of 18th St.	676	13′ 6″x13′ 3″	Rein Con.	Combined.
11	Eighteenth St.	12 ft. w. of 18th St. in St. Louis Ave	8 ft. s. of Wilson Ave.	374	13′ 6″x13′ 3″	Rein Con.	Combined.
11	Wilson Ave.	8 ft. s. of Wilson Ave. in 18th St.	11 ft. w. of C. L. of 15th St.	2,670	13′ 6″x13′ 3″	Rein Con.	Combined.
56, 14	Wilson Ave.	11 ft. w. of C. L. 15th St.	19 ft. w. of C. L. of 12th St.	1,353	13′ 0″x12′ 9″	Rein Con.	Combined.
14	Twelfth St.	19 ft. w. of C. L. 12th St. in Wilson.	10 ft. e. of 12 th St. in Hill	2,016	12′ 3″	Rein Con.	Combined.
14	Hill St.	10 ft. e. of 12th St.	10 ft. w. of 9th St.	1,362	12′ 0″	Rein Con.	Combined.
20	Ninth St.	10 ft. w. of 9th St. in Hill St.	Seventh St. Road	855	12′ 0″	Rein Con.	Combined.
20	Seventh St. Rd.	Ninth St.	8 ft. s. e. of 7th St. Rd. in Davies Ave.	196	12′ 0″	Rein Con.	Combined.
20	Davies Ave.	Seventh St. Road	7th St. (if extended from south)	1,401	12′ 0″	Rein Con.	Combined.
29	Private property	Seventh St. (if extended from the south)	301 ft. w. of 4th St. in Avery Ave.	1,111	7′ 8″	Rein Con.	Combined.
29	Avery Ave.	301 ft. w. of Fourth St.	2 ft. e. of Third St.	863	7′ 8″	Rein Con.	Combined.
29	Avery Ave.	2 ft. e. of Third St.	18 ft. w. of C. L. of Brook	1,365	7′ 0″	Rein Con.	Combined.
D. L.	St. Catherine St.	8 ft. e. of C. L. of Eighth St.	19 ft. w. of Garvin Pl.	1,414	42″	Pl. Con.	Combined.
D. L.	St. Catherine St.	19 ft. w. of Garvin Pl.	Sewer in e. sidewalk of 3d	1,042	36″	Pl. Con.	Combined.
	St. Louis Ave.	Cane Run Road	18th St.	See	Southern Outfall.		
24	St. Xavier St.	Sewer in Twenty-sixth St.	Twenty-seventh St.	483	27″	Pl. Con.	Combined.
24	St. Xavier St.	Twenty-seventh St.	Twenty-eighth St.	386	22″	Vit. Pipe	Combined.
	Stevens Ave.	Norris Pl.	Schwartz Ave.	See	Castlewood Sewer.		
59	Sycamore Ave.	115 ft. w. of Jane St.	Jane St.	118	20″	Vit. Pipe	Storm Water.
59	Sycamore Ave.	112 ft. w. of Jane St.	Jane St.	122	8″	Vit. Pipe	Sanitary.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
64	Third St.	Avery Ave.	Sewer in A St.	1,447	51″	Pl. Con.	Combined.
64	Third St.	Avery Avenue	32 ft. s. of C. L. of Avery	34	24″	Pipe in Con.	Combined.
64	Third St.	32 ft. s. of C. L. Avery Ave.	1,264 ft. s. C. L. Brandeis.	1,711	33″	Pl. Con.	Combined.
64	Third St.	1,264 ft. s. of C. L. Brandeis Ave.	48 ft. s. C. L. Southern R. R	900	24″	Pl. Con.	Combined.
64	Third St.	48 ft. s. of C. L. Southern R. R.	60 ft. n. of C. L. of K St.	670	18″	Vit. Pipe	Combined.
68	Third St.	Central Ave.	1,010 ft. s. of Central Ave.	1,040	20″	Vit. Pipe	Combined.
44	Thirty-fourth St.	Ohio River	Sewer in 34th St., 194 ft. s. of Water St.	592	7′ 0″x6′ 8″	Rein. Con.	Combined.
83	Thirty-fourth St.	Cedar St.	Hanover St.	787	45″	Pl. Con.	Combined.
85	Thirty-second St.	Southern Outfall	N. shoulder Woodland Ave.	22	54″	Pl. Con.	Combined.
85	Thirty-second St.	N. shoulder Woodland Ave.	19 ft. n. of s. line Dumesnil.	934	66″	Pl. Con.	Combined.
85	Thirty-second St.	19 ft. n. of s. line Dumesnil. St.	Virginia Ave.	496	60″	Pl. Con.	Combined.
27	Transit Ave.	Willow St.	583 ft. n. e. of Willow St.	625	18″	Vit. Pipe	Storm Water.
27	Transit Ave.	583 ft. n. e. of Willow St.	1,312 ft. n. e. of Willow St.	729	12″	Vit. Pipe	Storm Water.
27	Transit Ave.	Willow St.	1,313 ft. n. e. of Willow St.	1,344	8″	Vit. Pipe	Sanitary.
27	Transit Ave.	24 ft. s. w. of C. L. Willow St.	Hilliard St.	279	27″	Pl. Con.	Storm Water.
27	Transit Ave.	Hilliard St.	7 ft. n. e. of C. L. Everett	324	18″	Vit. Pipe	Storm Water.
27	Transit Ave.	7 ft. n. e. of C. L. Everett Ave.	98 ft. n. e. of Cherokee Rd.	354	12″	Vit. Pipe	Storm Water.
27	Transit Ave.	Willow St.	95 ft. n. e. of Cherokee Rd.	985	8″	Vit. Pipe	Sanitary.
25	Twelfth St.	Southern Outfall at Wilson Ave.	Oak St.	1,256	8′ 0″	Rein. Con.	Combined.
25	Twelfth St.	Oak St.	Zane St.	1,259	7′ 3″	Rein. Con.	Combined.
25	Twelfth St.	Zane St.	Garland Ave.	923	7′ 0″	Rein. Con.	Combined.
25	Twelfth St.	Garland Ave.	Western Outfall in Breckinridge St.	493	7′ 0″x6′ 9″	Rein. Con.	Combined.
	Twelfth St.	Wilson Ave.	Hill St.	See Southern Outfall.			
79	Twenty-eighth St.	Walnut St.	Jefferson St.	989	24″	Pipe in Con.	Combined.
79	Twenty-eighth St.	Jefferson St.	Alley, 1st, s. of Market St.	290	15″	Vit. Pipe	Combined.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
8	Twenty-fifth St.	S. line of Bank St.	11 ft. s. C. L. Griffiths Av.	941	5′ 6″	Pl. Con.	Combined.
9	Twenty-fifth St.	11 ft. s. of C. L. of Griffiths Ave.	24 ft. n. of C. L. of Main St	2,033	5′ 2″	Pl. Con.	Combined.
9	Twenty-fifth St.	24 ft. n. of C. L. of Main St.	N. line of Jefferson St.	1,010	52″	Pl. Con.	Combined.
57	Twenty-first St.	Cedar St.	Jefferson St.	492	30″	Pl. Con.	Combined.
58	Twenty-first St.	St. Louis Ave.	21 ft. s. C. L. St. Louis Ave	18	57″	Pl. Con.	Combined.
58	Twenty-first St.	21 ft. s. of C. L. of St. Louis Ave.	Bolling Ave.	1,492	5′ 0″	Rein. Con.	Combined.
	Twenty-first St. (if extended)	1st alley n. of High Ave.	Sewer in 21st St., 140 ft. n. e. of High Ave.	See	Happy Hollow	Sewer.	
8	Twenty-fourth St.	S. line of High Ave.	N. line of Portland Ave.	986	5′ 10″x5′ 6½″	Rein Con.	Combined.
8	Twenty-fourth St.	S. line of Portland Ave.	N. line of Bank St.	646	5′ 6″	Pl. Con.	Combined.
9	Twenty-fourth St.	S. line of Jefferson St.	19 ft. n. of C. L. Cedar St.	428	45″	Pl. Con.	Combined.
9	Twenty-fourth St.	19 ft. n. of C. L. Cedar St.	5 ft. n. of Walnut St.	487	39″	Pl. Con.	Combined.
9	Twenty-fourth St.	5 ft. n. of Walnut St.	18 ft. n. of C. L. Madison	416	30″	Pl. Con.	Combined.
9	Twenty-fourth St.	18 ft. n. of C. L. Madison St.	1st alley, s. of Madison St.	222	18″	Vit. Pipe	Combined.
15	Twenty-ninth St.	Western Outfall in Broadway	531 ft. n. of C. L. Broadway	565	45″	Pl. Con.	Combined.
15	Twenty-ninth St.	531 ft. n. of C. L. of Broadway	945 ft. n. of C. L. Broadway	414	42″	Pl. Con.	Combined.
15	Twenty-ninth St.	945 ft. n. of C. L. of Broadway	19 ft. s. of C. L. Chestnut	465	39″	Pl. Con.	Combined.
15	Twenty-ninth St.	19 ft. s. of C. L. of Chestnut St.	2 ft. s. of C. L Madison St	415	33″	Pl. Con.	Combined.
15	Twenty-ninth St.	2 ft. s. of C. L. of Madison St.	Walnut St.	403	24″	Pl. Con.	Combined.
	Twenty-seventh St.	27th St. at 1st alley s. of Rudd Ave.	See Happy Hollow Sewer.				
65	Twenty-third St.	St. Louis Ave.	Sewer in Ormsby Ave.	604	48″	Pl. Con.	Combined.
	Tyler Park	Castlewood Ave.	Edenside Ave.	See	Castlewood Se	wer.	
D. L.	Underhill St.	Beargrass Intercepter	Sneads Branch Sewer	21	18″	Vit. Pipe & Pl.Con.	Sanitary
30	Vernon Ave.	453 ft. n. of Frankfort Ave.	352 ft. n. of Sycamore Ave.	604	20″	Vit. Pipe	Storm Water.
30	Vernon Ave.	352 ft. n. of Sycamore Ave.	754 ft. n. of Sycamore Ave.	402	15″	Vit. Pipe	Storm Water.
30	Vernon Ave.	453 ft. n. of Frankfort Ave.	56 ft. n. of Frankfort Ave.	401	15″	Vit. Pipe	Storm Water.

Location and Description of Sewers Constructed by the Commissioners of Sewerage—Continued.

Contract Number	Located In	From	To	Length In Feet	Size	Kind	Purpose
30	Vernon Ave.	61 ft. n. of Frankfort Ave.	836 ft. n. of Sycamore Ave.	1,474	8″	Vit. Pipe	Sanitary.
21	Walnut St.	Thirteenth St.	2 ft. e. of Twelfth St.	520	20″	Vit. Pipe	Combined.
21	Walnut St.	2 ft. e. of Twelfth St.	28 ft. w. of C. L. of 11th	419	18″	Vit. Pipe	Combined.
22	Walnut St.	18 ft. e. of C. L. Twenty-sixth St.	582 ft. w. of 24th St.	177	24″	Pl. Con.	Combined.
22	Walnut St.	582 ft. w. of Twenty-fourth St.	370 ft. w. of 24th St.	212	27″	Pl. Con.	Combined.
22	Walnut St.	370 ft. w. of Twenty-fourth St.	Twenty-fourth St.	407	30″	Pl. Con.	Combined.
22	Walnut St.	Twenty-fourth St.	1st alley w. of 22d. St.	688	22″	Vit. Pipe	Combined.
22	Walnut St.	472 ft. w. of Twenty-second St.	Twenty-second St.	502	18″	Vit. Pipe	Combined.
22	Walnut St.	Twenty-second St.	Twenty-first St.	481	22″	Vit. Pipe	Combined.
22	Walnut St.	Twenty-first St.	Twentieth St.	272	24″	Vit. Pipe	Combined.
D. L.	Wenzel St.	E. bank of Beargrass Creek	Clean-out Chamber	59	16″	C. I. Pipe	Sanitary.
D. L.	Wenzel St.	Clean-out chamber	32 ft. n. C. L. Broadway	144	18″	Vit. Pipe	Sanitary.
D. L.	Webster St.	2 ft. s. of C. L. Webster St.	Webster St. Sewer	19	12″	Vit. Pipe	Sanitary.
	Western Intercepter:						
72, 49	State Fair Grounds	Southern Outfall	6 ft. s. C. L. Broadway	5,356	5′ 0″	Rein. Con.	Sanitary.
49	45th St. and private property Shawnee Park	6 ft. s. of C. L. of Broadway	Northwestern Sewer	1,787	42″	Pl. Con.	Sanitary.
27	Willow Ave.	Slaughter Ave.	282 ft. e. of Glenmary Ave.	575	15″	Vit. Pipe	Storm Water.
27	Willow Ave.	Slaughter Ave.	284 ft. e. of Glenmary Ave.	576	8″	Vit. Pipe	Sanitary.
27	Willow St.	Transit Ave. (on W.)	Transit Ave. (on e.)	345	30″	Pl. Con.	Storm Water.
27	Willow St.	Transit Ave. (on E.)	Slaughter Ave.	304	18″	Vit. Pipe	Storm Water.
27	Willow St.	Transit Ave. (on W.)	Slaughter Ave.	665	8″	Vit. Pipe	Sanitary.
	Wilson Ave.	Eighteenth St.	Twelfth St.	See Southern Outfall.			
	Woodland Ave.	Thirty-eighth St.	Cane Run Rd.	See Southern Outfall.			
D. L.	York St.	1 ft. e. of e. line of Seventh St.	19 ft. e. of w. line of 6th	443	30″	Pl. Con.	Combined.
D. L.	York St.	9 ft. e. of C. L. of Fifth St.	4 ft. w. of w. line 4th St.	438	30″	Pl. Con.	Combined.

APPENDIX D.

Table of Rights of Way.

CONTRACT NO. 62, BROOK STREET SEWER:

W. P. Brown & Sons Lumber Co., 326 feet.
Kentucky Wagon Mfg. Co., 335 feet.
Southern Railway Co. in Kentucky, 67 feet.
Louisville & Nashville R. R. Co., 668 feet.

CONTRACT NO. 67, SECTION "B" MIDDLE FORK SEWER:

L. H. Lewis, 36 feet.
Xavier Schuler, 115 feet.
Mary Schoenbachler, 38 feet.
M. L. Liebert, 371 feet.
Pius Metcalf, 77 feet.
Katie Deming, 33 feet.
A. J. Greenwald,, 50 feet.
Magdalena Huck, 451 feet.
Mary H. Keating, 235 feet.

CONTRACT NO. 76, SECTION "C," MIDDLE FORK SEWER:

Katherine Fust, 244 feet.
Rev. Jas. P. Cronin, Admr., 695 feet.
C. V. Mehler, 235 feet.
A. D. Norris, 509 feet.
Elsie Trautwein, 164 feet.
P. D. and R. J. Lorenz, 59 feet.

SECTION "D," MIDDLE FORK SEWER:

Old Kentucky Distillery, 1,091 feet.

CONTRACT NO. 69, SECTION "C," NORTHEASTERN SANITARY TRUNK SEWER:

Mary M. Frantz, 536 feet.
J. H. G. Wallbaum, 37 feet.
Lizzie M. Cain, 45 feet.
F. H. Miller, 112 feet.
Frank Scheirich, 102 feet.
Wm. Palmer, 532 feet.
Sarah C. Young, 180 feet.

APPENDIX D—Continued.

CONTRACT NO. 72, SECTION "A," WESTERN INTERCEPTER:

Kentucky State Board of Agriculture, Forestry and Immigration	569 feet.
Henry Bickel	931 feet.
Paulina E. Garr	1,056 feet.
James Clark, Jr.	546 feet.
Whallen Bros.	83 feet.

CONTRACT NO. 81, LONG AVENUE SEWER:

P. D. & R. J. Lorenz	439 feet.
Frank Miller	227 feet.
Martha Sampson	195 feet.
Eastern Realty Co.	39 feet.

SOUTHEASTERN SEWER CONNECTION:

William Krupp	400 feet.

ENTERPRISE SEWER CONNECTION:

Lawrence Liebert	1,078 feet.
Pius and Max Fischer	65 feet.

WEBSTER STREET SEWER CONNECTION:

C. F. Vissman & Co.	218 feet.
Louisville & Nashville R. R. Co.	110 feet.
New Louisville Packing Co.	124 feet.
The American Oak and Leather Co.	194 feet.
Joe Scheffer, Jr.	96 feet.
W. W. Gregory	48 feet.
Catherine Bouchard	44 feet.
Mary Smith	72 feet.
Elizabeth Schott	52 feet.
Jacob Steurer	86 feet.
Charles W. Schott	20 feet.
Agatha Steurer	25 feet.
John F. Oertel Co., Inc.	52 feet.

SECTION "B," NORTHEASTERN STORM DRAIN:

Louisville & Nashville R. R. Co.	29 feet.
Louisville & Jeffersonville Bridge Co.	576 feet.

APPENDIX D—Continued.

IMPROVEMENT OF BEARGRASS CREEK:

Louisville & Nashville R. R. Co.
C. F. Vissman & Co.
John Cudahy.
Louisville & Jeffersonville Bridge Co.
Bourbon Stock Yards Co.
P. Macauley Birckhead.
Catherine Rehm.
Joseph and William Spahn.
Jacob Frank.
Peter A. Frank.
Julia Heick.
A. Habich.
Geiger, Fisk and Koop.
Leo Messmer.
Daniel Weiss.
Lorenz Pezold.
H. H. Baumeister.
Henry Bickel.
Louisville Tobacco Warehouse Co.
Geo. C. Jetter and others.

APPENDIX E.

TABLE 1.

INTENSITY OF PRECIPITATION.

January, 1910—March, 1913.

Date	Total Fall	Duration		Maximum Rate Per Hour for							
		Hrs.	Min.	10 Min.	20 Min.	30 Min.	45 Min.	1 Hr.	75 Min.	90 Min.	2 Hrs.
1910											
Apr. 16	1.53	5	26	2.10	1.53	1.16	1.17	1.05	0.87	0.77	0.62
May 7	1.27	13	30	1.50	1.11	0.82	0.59	0.45	0.36	0.30	0 23
June 10	2.27	9	47	1.14	0.93	0.90	0.79	0.69	0.64	0.58	0.50
July 4	0.66	1	30	2.28	1.50	1.06	0.79	0.63	0.51	0.43	0.33
July 6	1.79	12	42	1.92	1.38	1.14	0.80	0.61	0.66	0.57	0.44
July 9	1.63	5	03	4.08	2.37	1.74	1.32	1.00	0.79	0.67	0.50
July 16	1.77	11	41	1.62	1.02	0.78	0.76	0.66	0.56	0.49	0.42
July 28	0.60	1	35	1.44	1.11	0.90	0.69	0.55	0.43	0.39	0.30
Aug. 21	1.37	5	57	3.48	1.98	1.32	0.88	0.66	0.53	0.44	0.33
Sept. 4	0.54	2	41	1.50	1.08	0.96	0.69	from U. S. W. Bur.			
Oct. 4	0.83	3	28	2.46	1.71	1.30	0.92	0.74	0.62	0.54	0.42
Oct. 5	3.13	32	30	1.08	0.96	0.76	0.68	0.60	0.54	0.52	0.45
Oct. 6	2.38			1.76	1.32	1.30	1.13	0.97	0.85	0.76	0.61
Nov. 27	2.53	14	42	3.00	1.68	1.42	0.99	0.87	0 70	0.62	0.70
1911											
May 1	0.84	6	44	1.32	1.12	0.56	0.29	0.29	0.24	0.21	0.20
June 23	1.45	10	13	3.12	1.65	1.58	1.63	1.26	1.03	0.87	0.67
July 11	1.70	1	12	5.70	3.72	2.88	2.17	1.65	1.35	1.13	0.85
July 20	1.14	1	18	3.60	2.40	2.00	1.47	1.11	0.90	0.76	0.57
Aug. 28	1.39	4	41	1.56	1.14	0.92	0.67	0.69	0.62	0.55	0.47
Sept. 10	0.83	6	11	2.22	1.20	0.80	0.73	0.59	0.46	0.39	0.29
Sept. 13	1.26	5	49	1.56	0.63	0.64	0.68	0.62	0.61	0.57	0.51
Oct. 1	1.14	10	01	2.18	1.26	0.88	0.63	0.47	0.42	0.37	0.31
1912											
Apr. 17	0.71	..	36	3.66	1.95	1.38	0.95	0.71	0.57	0.47	0.36
Apr. 22	0.71	2	13	1.86	0.99	0.72	0.49	0.39	0.42	0.43	0.35
Apr. 26	3.02	22	..	2.82	1.86	1.54	1.21	1.35	1.23	1.09	0.92
May 5	1.00	2	40	2.16	1.83	1.40	1.03	0.85	0.75	0.63	0.48
May 11	0.61	7	..	2.10	1.35	0.96	0.65	0.49	0.39	0.33	0.26
May 28	0.48	1	26	1.98	1.08	0.74	0.49	0.37	0.33	0.32	0.24
June 16, 17	2.57	19	15	2.64	2.31	1.98	2.00	1.89	1.66	1.42	0.98
July 8	0.64	..	40	1.92	1.50	1.20	0.85	0.64	0.51	0.43	0.32
July 15	1.43	2	50	3.60	2.85	2.46	1.83	1.40	1.12	0.93	0.71
Aug. 12	0.67	2	40	2.40	1.44	0.84	0.56	0.45	0.37	0.41	0.31
Aug. 20	0.90	3	55	1.32	1.11	0.84	0.60	0.47	0.40	0.35	0.30
Aug. 22	0.58	1	25	1.92	1.05	0.78	0.69	0.56	0.46	0.39	0.29
Aug. 29	0.99	5	..	1.74	1.68	1.20	0.91	0.61	0.62	0.57	0.44
Sept. 3	0.71	..	52	2.52	1.56	1.30	0.91	0.69	0.55	0.46	0.35
Sept. 17	0.74	6	..	1.14	0.84	0.60	0.49	0.39	0.35	0.32	0.26
Oct. 17, 18	1.43	26	10	1.02	0.81	0.64	0.45	0.35	0.36	0.29	0.23
1913											
Jan. 6, 7	3.33	41	38	1.50	0.99	0.84	0.71	0.60	0.52	0.45	0.36
Jan. 23	1.18	11	05	1.02	0.78	0.58	0.41	0.32	0.27	0.25	0.23
Mch. 13	0.88	2	30	1.62	0.87	0.66	0.64	0.56	0.52	0.47	0.41
Mch. 25, 26	5.58	46	45	3.12	2.82	2.34	1.79	1.42	1.22	1.03	1.00

APPENDIX E—Continued.

TABLE 2.

COMPARATIVE DATA

(From U. S. Weather Bureau.)

Monthly and Annual Precipitation.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1871 ..	....	....	....	....	....	....	....	....	1.48	1.55	2.50	3.29	....
1872 ..	....	....	1.41	8.40	4.49	6.19	3.67	2.45	4.41	3.92	0.56	2.58	....
1873 ..	2.93	5.42	3.39	3.05	5.73	3.87	3.43	3.04	2.47	3.26	2.19	6.99	45.77
1874 ..	2.39	5.18	6.63	6.01	1.14	2.95	2.83	3.23	0.62	2.04	5.90	4.77	43.69
1875 ..	2.42	2.09	4.54	0.99	4.07	5.79	**16.46**	2.19	1.05	1.92	6.14	5.67	53.33
1876 ..	11.63	2.92	6.01	4.50	**1.00**	6.52	3.61	4.23	2.66	7.61	1.63	**1.24**	53.56
1877 ..	3.95	**0.44**	4.93	5.31	3.98	5.57	4.19	2.70	3.02	1.81	4.49	4.19	44.58
1878 ..	3.25	2.25	4.06	3.53	4.50	5.34	4.08	4.21	2.52	3.44	4.78	5.10	47.06
1879 ..	2.52	2.31	5.66	4.63	1.68	3.39	**1.18**	10.02	5.88	0.59	4.90	**7.93**	50.69
1880 ..	4.61	5.40	5.14	7.32	6.09	4.11	2.18	2.82	2.44	6.39	3.83	3.52	53.85
1881 ..	3.24	4.05	2.46	3.45	2.35	3.78	2.18	**0.15**	2.70	3.44	2.79	6.00	36.59
1882 ..	6.29	9.69	5.85	2.17	**7.46**	5.23	4.57	5.45	3.57	1.56	2.67	1.99	**56.50**
1883 ..	3.52	8.72	3.22	6.63	2.59	1.98	4.74	0.86	**0.32**	**8.05**	6.05	4.86	51.54
1884 ..	1.94	**9.84**	3.76	2.91	5.75	3.59	3.94	4.81	**5.90**	2.00	1.86	5.11	51.41
1885 ..	6.34	2.88	1.02	4.94	4.20	3.18	2.01	2.97	5.71	4.97	6.17	2.84	47.23
1886 ..	4.64	1.94	3.42	3.38	4.03	5.35	3.10	4.43	1.63	0.64	5.72	2.69	40.97
1887 ..	4.08	7.60	1.88	7.31	2.12	1.79	1.86	2.74	2.84	0.39	2.51	3.03	38.15
1888 ..	3.26	2.56	5.71	2.99	2.42	3.28	3.59	**10.53**	2.75	2.84	6.34	1.57	47.84
1889 ..	3.07	2.33	0.95	0.65	5.26	5.76	2.98	0.23	4.38	1.68	5.99	1.74	35.02
1890 ..	5.73	6.25	9.58	3.51	3.15	**6.96**	2.05	4.18	2.71	3.69	4.54	3.06	55.41
1891 ..	5.21	3.94	6.57	2.42	1.56	2.00	4.08	5.42	1.99	0.35	6.23	3.65	43.42
1892 ..	1.46	3.61	3.23	7.50	4.44	3.89	3.93	1.84	2.43	0.86	2.87	2.07	38.13
1893 ..	2.57	4.58	2.38	7.69	4.19	4.56	1.52	1.68	4.00	5.10	3.22	2.44	43.93
1894 ..	2.81	5.09	3.04	3.98	3.90	3.63	2.41	3.57	2.64	1.20	0.63	5.18	38.08
1895 ..	4.54	0.64	2.10	3.10	2.88	4.94	5.68	1.35	0.41	0.90	7.01	5.31	38.86
1896 ..	**0.82**	3.16	4.86	**0.25**	4.32	4.79	13.01	4.51	4.12	1.61	4.62	2.15	48.22
1897 ..	3.29	4.04	7.95	3.83	3.30	3.50	5.21	1.35	0.75	1.83	5.86	3.05	43.96
1898 ..	9.03	1.73	**9.94**	2.80	4.22	5.00	2.15	5.14	2.97	2.85	2.55	2.61	51.00
1899 ..	4.30	1.84	7.02	3.50	3.17	3.80	2.09	2.72	0.89	2.41	2.05	4.07	37.86
1900 ..	3.10	3.74	1.50	2.29	5.58	3.28	2.67	3.43	1.05	2.22	**7.43**	1.75	38.04
1901 ..	0.98	1.16	3.59	2.49	2.45	4.12	2.85	2.86	2.78	0.49	1.17	4.59	29.53
1902 ..	4.67	0.62	2.10	2.05	6.41	6.51	1.87	2.74	4.03	1.15	3.85	5.65	41.65
1903 ..	2.43	6.03	3.18	4.82	2.23	3.52	1.25	3.51	0.83	1.60	2.71	1.58	33.69
1904 ..	2.43	3.54	6.49	2.67	1.77	1.71	1.70	2.11	2.65	0.27	**0.25**	3.66	**29.25**
1905 ..	2.24	2.23	3.61	2.14	6.79	4.03	5.13	3.76	2.95	5.72	5.16	5.48	49.24
1906 ..	2.68	1.55	6.51	2.02	2.52	2.80	4.83	1.92	4.12	0.99	7.10	5.02	42.06
1907 ..	**12.11**	1.25	5.06	2.42	5.30	**1.21**	5.63	3.68	1.46	2.96	3.13	3.27	47.48
1908 ..	1.98	5.68	6.54	6.06	4.26	3.27	3.61	2.29	0.59	**0.07**	1.65	1.85	37.85
1909 ..	3.25	9.64	5.08	5.86	4.15	3.59	7.23	0.83	2.18	4.06	1.73	2.81	50.41
1910 ..	3.25	5.62	**0.12**	4.61	3.96	4.08	10.21	2.31	2.18	6.70	3.32	3.65	50.01
1911 ..	2.31	2.80	2.30	5.35	2.08	2.70	3.43	2.71	4.66	2.89	3.79	4.36	39.38
1912 ..	3.45	2.74	5.70	**8.60**	3.61	3.49	4.68	5.06	3.03	2.43	0.65	2.52	45.96
Mn's .	3.88	3.93	4.35	4.10	3.78	4.03	4.09	3.32	2.66	2.61	3.77	3.69	44.28

Note—Highest and lowest monthly precipitation in bold-faced figures.

9 ....
3 ...
45.
43.6
53.
53.5
44.5
47.0
50.6
53.8

36.5
56.50
51.5
51.41
47.2
40.97
38.15
7.84
5.02
5.42

3.42
.13
.93
.08
86
22
6

6
4